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CATARRHAL DIPHTHERITIC CONJUNCTIVITIS

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WHENEVER one speaks about diphtheritic conjunctivitis, one immediately thinks of a pseudo-membranous production that covers the tarsal conjunctiva and adheres to it more or less tightly.

There is, however, another form of diphtheritic conjunctivitis, less frequent certainly, but nevertheless, quite as real as the former; the catarrhal form, which, although it may be met with at any time of life, usually affects the newly-born child and may, consequently, be ranged among the ophthalmias neonatorum.

Clinical Observations

Case 1.—B. G. was born prematurely after 7 months, on January 20, 1931, and, since her birth, she has shown rather an accentuated rhinitis.

On January 28, a slight muco-purulent secretion of the left eye was noticed and protargol was instilled several times.

On January 30, the secretion disappeared, only to reappear by March 15 affecting both eyes. Notwithstanding fresh instillations of protargol, the state remained unaltered up to April 6, when the existence of a growing small whitish stain on the inner inferior

part of the left cornea induced the parents to bring us the child on April 10.

At that moment, the left eye presented a large and very deep ulcer, which extended concentrically to the limbus and occupied the greater part of the inner-lower portion of the cornea and was about 4 by 5 mm. (Fig. 1.)

It was surrounded with a dense stripe of grey infiltration, that was uniformly marked on all its circumference. The slightly less opaque, grey-yellowish background looked as if it had been punched out. Its edge was separated from the limbus by a narrow strip of intact cornea.

Besides the ulcer, the cornea had lost its brilliancy and had a dull, dry and opalescent aspect. It was, nevertheless, possible to see that the pupil was obstructed by exudations and that there existed a very thick, but not copious, hypopyon.

The bulbar conjunctiva was congested. The ciliary injection was only slightly marked. A clot of pus had amalgamated into the inner canthus of the eye and a few filaments lingered in the lower fornix. The eyelids showed slight oedema. There was no dacryocystitis.

The microscopic examination of the greyish exudation of the ulcer edge, as well as that of the conjunctival secretions, showed the presence of Gram-positive diplococci. Consequently, it seemed to be a pneumococcal ulcer.

We prescribed instillations of atropine and applications of collargol ointment together with a bandage and a 2 c.c. injection of milk, which was repeated on April 12.

The right eye presented only a slight injection of the palpebral conjunctiva; the bulbar conjunctiva was white. A small quantity of pus had accumulated into the inner canthus of the eye. There was no dacryocystitis.

On April 14, the ulcer of the cornea showed signs of imminent perforation. Descemet's membrane, which was denuded, was undoubtedly ectatic.

On April 18, the ulcer had perforated and the iris was enclosed in the aperture, forming a hernia under the shape of a small, blackish cyst; the remainder of the cornea was completely opaque. In the evening the crystalline lens was found in the lower fornix.

On April 27, the perilimbal part of the bulbar conjunctiva presented a peculiar aspect in the lower half of the right eye; it was slightly swollen, dull and opaque; it was covered with a whitish coating, that overlapped the cornea to a certain extent; this coating, which seemed to consist of an extremely flimsy froth, was easily taken away, but reappeared quickly; the surface of the conjunctiva did not retain that wet and shining brilliancy, which is usual, and tears did not seem to moisten it any longer.

Thinking of xerosis, we examined the coating with the aid of the microscope and found motionless and Gram-positive diphtherimorph bacilli, showing a fragmentary colouration, as well as Neisser's polar bodies.

On solidified serum they gave, after 24 hours' incubation, numerous dry colonies, as large as the head of a pin, raised, roundish, white-greyish and with neat edges. They were more opaque in their centre than in their periphery.

They grew with more difficulty on gelose; they did not liquify gelatine, did not grow on potatoes nor did they coagulate milk. They troubled the broth and produced acid therein. They throve in absence of air and fermented the glucose. They were possessed of a haemolytic power.

We injected a guinea-pig, weighing 350 gr., with 0·5 c.c. of the broth culture, 24 hours old; a viscous oedema was produced at the point of injection; that oedema was followed by an eschar. A few signs of toxi-infection followed; progressive loss of weight, rise of temperature (up to 39·2°C.) prostration. At last the animal died after 10 days (it then weighed 290 gr. only). The post-mortem examination did not reveal any characteristic lesion.

As the virulence of the bacillus did not seem to be much accentuated and as a mere nocive influence of the toxins, freed by the destruction of the injected microbes, might have been feared, we inoculated another guinea-pig, which had previously received an injection of antidiphtheritic serum; no reaction, either local or general, took place.

Consequently the diphtherimorph bacillus is a genuine diphtheriticus one.

The conjunctival secretion, besides numerous bacilli, contained a few Gram-positive diplococci. They were easily grown on gelose, to which serum had been added, and they gave birth to a thin sowing of dot-shaped and transparent colonies; they did not liquefy gelatine and did not grow on potatoes. In broth they produced a slight cloud, gradually disappearing by way of sedimentation. They coagulated milk rather tardily. They were dissolved by ox-gall, and, when injected under the skin of a mouse, they killed the latter after 48 hours.

Consequently pneumococci had associated with Loeffler's bacilli.

As we were dealing with an ocular diphtheria, on May 4 we effected a first injection of 5,000 units of antidiphtheritic serum and another on May 5.

In the meantime we went on with our researches from the aetiological point of view, and we prepared different cultures from the nasal and pharyngeal secretions of the child, the mother and grandmother; but those experiments did not reveal any bacilli diphtheritici.

However, we heard that the midwife, who had stayed with the baby for 20 days, had had such a severe angina that she could hardly speak at all, and that in the second half of February, the mother had had a sore throat for a week, while the grandmother had complained of a bad throat for one day at about the same time.

On May 6, the right eye already showed a better aspect; the perilimbal bulbar conjunctiva was less dull and more shining; the coating that had covered it had nearly disappeared. The left eye had undergone, by far, the greater improvement; the cornea had cleared up and its ulcerated part was cicatrizing.

On May 7, a fresh injection of 5,000 units of antidiphtheritic serum was effected.

We saw the patient again on May 12. The right eye was completely healed. As to the left eye, it showed no symptoms of inflammation any longer; the cornea presented a cicatrization stain, that was white-greyish and opaque with a faint reddish hue, resultant on the presence of many blood vessels. This stain had taken the place of the old ulcer. The rest of the cornea had found its transparency again; the aqueous humour did not present any more trouble; the pupil was cleaned, though deformed, and had shifted towards the nasal side, the iris adhering to the leucoma. The eye had a normal volume and did not show, for the time being, any symptom of atrophy.

The patient had been suffering since her birth from a tenacious rhinitis, which has also been cured by serotherapy. Are we warranted, notwithstanding the negative cultures, in deciding on the diphtheritic nature of that rhinitis? We think we are.

As to the origin of that ocular diphtheria, we have only been able to retain one source of contamination—the midwife's angina.

To conclude, let us draw the reader's attention to the rapid and indisputable efficacy of the antidiphtheritic serotherapy.

Case 2.—On June 5, we were brought a small boy, one month old. It had been noticed that since his birth his eyelashes had been sticking together in the morning, that some pus used to gather, during daytime in the inner canthus of the eye and that rather an acute rhinitis affected the child.

The ocular affection had been attended to by means of argyrol instillations, but without any success; all other treatments, taken against that rhinitis, had given no result whatever.

On examination we saw that the lashes of both eyelids were sticking together owing to small yellowish concretions, formed by dried pus. We had to separate them to open the eyelids. We noticed then that canary-yellow muco-purulent secretions had accumulated at the inner canthus of the eye under the shape of

FIG. 1.

Ulcer of the cornea of the left eye (Case 1).

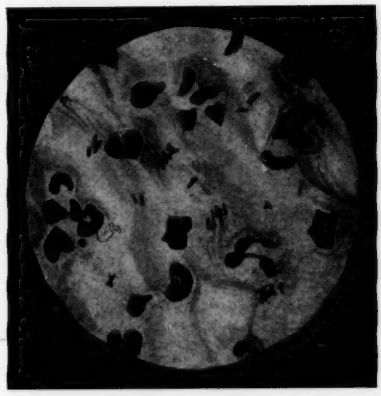

FIG. 2.

Loeffler's bacilli (conjunctival secretion of Case 3, coloured by Gram's method).

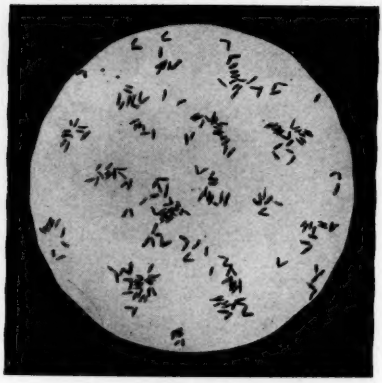

FIG. 3

Loeffler's bacilli (culture on solidified ox-serum, coloured by methylene blue).

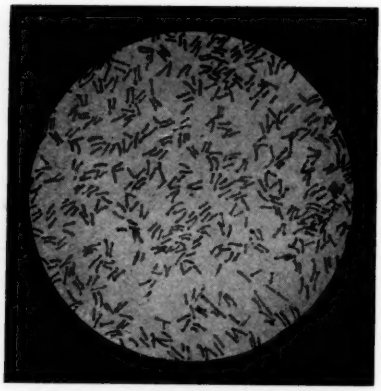

FIG. 4.

Baccilli diphtheritici (culture on solidified ox-serum, coloured by Ernst-Neisser's method).

small concretions and that some muco-purulent filaments and flakes lingered in the lower fornix.

The palpebral conjunctiva was quite red; the bulbar conjunctiva only showed a few streaks of injection. On all its surface, the skin of the eyelids showed a slight and uniform erythematous colouration. The upper lids presented a very slight oedema.

The left lacrimal canal was quite permeable. On the right, by pressing on the lacrimal sac, we caused some muco-purulent secretion to ooze out through the lacrimal puncta; we could thus deduce the presence of congenital dacryocystitis.

There was, on both sides, a slight preauricular adenopathy, having the volume of a small pea. We also noticed a bilateral muco-purulent coryza. The edges of both nostrils were covered with dirty, brownish scurfs, formed by dried secretion. Under the nose was an erythematous spot, due to the irritation of the skin, caused by the nasal flow.

As there existed a congenital dacryocystitis, one, of course, on account of the conjunctival inflammation, thought of a conjunctivitis of the newly-born, having a lacrimal origin.

But the conjunctival secretion, besides a few cocci, contained numerous diphtherimorph bacilli, showing a fragmentary colouration and Neisser's polar bodies. These bacilli easily grew on solidified ox-serum and gave elevated, roundish and greyish colonies. They grew with more difficulty on gelose; they did not liquefy gelatine, nor did they coagulate milk. They did not thrive on potatoes and produced acid in broth. They developed in the entirety of Veillon's gelose without spreading in the open air and fermented the glucose. They also possessed haemotoxic power.

The injection under a guinea-pig's skin of 0·5 c.c. of the broth culture, 24 hours old, produced a local, subcutaneous, gelatinous oedema, followed by an eschar, which gradually disappeared; some symptoms of toxi-infection took place; loss of weight of 40 gr., rise of temperature (up to 39°C.), prostration. However, the animal recovered completely and regained its weight within a fortnight.

As we had not kept the microbian stock, we found it impossible to repeat the operation with a guinea-pig that had been rendered immune. However, in the conjunctivitis cases, the secretion of which contained pseudo-diphtheritic bacilli, a stronger injection (1 c.c. of microbian culture) has never given us the slightest reaction, either local or general.

Besides numerous bacilli, the conjunctival secretion contained a few Gram-positive diplococci. Those cocci were easily grown on gelose, containing serum, and gave birth to a thin sowing of dot-shaped and transparent colonies. They did not liquefy gelatine

and did not develop on potatoes. In broth they produced a cloud, disappearing by way of sedimentation. They caused milk to coagulate rather slowly. They were dissolved by ox-gall and, when injected under the skin of a mouse, they killed the animal after 48 hours. We were thus in presence of pneumococci.

Consequently, the baby presented a catarrhal conjunctivitis, due to the diphtheria bacillus, associated with the pneumococcus.

One might have wondered whether one had witnessed a diphtheritic conjunctivitis or a pneumococcic one. Chance would have it that we were in a position to solve the enigma without any difficulty, because the twin-sister of the little patient also had a conjunctivitis, the secretion of which yielded pure cultures of Loeffler's bacilli, as pointed out in the next case. This is, of course, very strong evidence on behalf of the diphtheritic nature of the little boy's conjunctivitis.

Is it possible that the dacryocystitis could have been of the same nature? We carefully and repeatedly cleansed the conjunctival sac and, after having several times pressed out the lacrimal sac, we sowed part of the secretion, that we contrived to take up by means of a probe from inside the lacrimal sac. The culture did not give us anything but pneumococci.

Was the rhinitis also of a diphtheritic nature? Very likely so, although the cultures of the nasal and pharyngeal secretions only revealed micrococci.

We could not get any information enabling us to discern the origin of the diphtheritic infection. The cultures that we effected with the pharyngeal secretions of the father and mother and of a relative, who had frequently been in close touch with the child, only showed common micrococci. We noted no angina case either in the family or in the persons about the child.

The treatment consisted in a subcutaneous injection of 5,000 units antidiphtheritic serum, effected twice in consecutive days. The result of this therapy proved excellent, when all previous treatments had given no improvement whatever; on June 9, the conjunctivitis was quite cured and the rhinitis was much improved already; but the dacryocystitis still persisted. We then effected a catheterisation of the lacrimal canal and, three days later, everything was in perfect order.

Case 3.—Together with the above mentioned little boy, his twin sister was brought to us. Since her birth, a purulent secretion, that soiled her eyes and flowed through her nostrils, had been observed. Treatment of the ocular inflammation and the rhinitis, had given no improvement.

On examining the child, we noticed that the lashes of both eyes were agglutinated by dirty yellow concretions, formed by dried

pus. On opening the eyelids, we saw that yellowish muco-pus had gathered in the inner canthus and that muco-purulent filaments and flakes were lingering in the lower fornix. The palpebral conjunctiva, as well as the fornix, were much congested. On the level of the bulbar conjunctiva, the hyperaemia was much less evident. The palpebral skin was slightly erythematous and the upper lids presented a slight oedema.

There was, on both sides, a slight preauricular adenopathy, having the volume of a small pea. The lacrimal canal was quite permeable.

We noted a bilateral rhinitis, which was characterized by a muco-purulent flow and by dried secretion under the form of brownish dirty scurfs, sticking to the edge of the nostrils; the latter showed a few small fissures.

The conjunctival secretion contained diphtherimorph bacilli (Fig. 2), which we have detected in the different cultures free from any other germs (Fig. 3).

These bacilli were morphologically similar to Loeffler's; they also fixed the colouring matter irregularly and carried Neisser's bodies (Fig. 4). On solidified serum they produced greyish, dot-shaped colonies, the surface of which was convex and whose edges were roundish. They developed less quickly on gelose and gave small, flat, opaque and white colonies, the edges of which were quite irregular. They did not liquefy gelatine. did not develop on potatoes and did not coagulate milk. In broth they produced a cloud of the fluid, small clots along the inner surface of the tube and a film at the top of the fluid; at the same time they produced acid.

They developed in anaerobiose without spreading in the open air. They caused glucose to ferment and had haemolytic properties.

Under the skin of a guinea-pig, weighing 320 gr., we injected 0·5 c.c. of broth culture, 24 hours old. At the place of injection sprung a subcutaneous and viscous oedema, which was followed by an eschar, that subsequently disappeared. A few symptoms of toxi-infection took place; progressive loss of weight of 60 gr., rise of temperature (up to 39·3°C.) prostration. However, the animal recovered and recuperated its initial weight after three weeks.

The catarrhal conjunctivitis affecting the child was consequently due to an unaccompanied Loeffler's bacillus.

Was the rhinitis also of a diphtheritic nature? One would feel inclined to think so, were it not for the fact that the cultures of the nasal and pharyngeal secretions showed nothing but common micrococci.

We did not set up any local treatment, but twice effected subcutaneous injections of 5,000 units antidiphtheritic serum in

consecutive days and obtained, on the third day, a complete cure of the conjunctivitis, as well as an important improvement of the rhinitis, whilst the ordinary methods had had no influence. The rhinitis itself was totally cured on the fifth day.

Case 4.—On November 19, we were brought a little girl, aged two months. Since her birth the lashes of her left eye were agglutinated in the morning, and in the daytime a yellowish secretion soiled the same eye. The right eye had never shown any disorder, except a fortnight previously, when there was—but only for one day—some pus in it.

Moreover, for 10 days, the child had been suffering from a coryza, which was so violent that she could hardly feed.

On her birth the midwife instilled silver nitrate and against the inflammation of the left eye several treatments were used without any result.

The right eye was absolutely normal. As to the left eye, it showed a perfectly characteristic catarrhal conjunctivitis; the lashes were sticking into brushes and small dirty and brownish concretions adhered to them. A yellowish muco-pus had gathered in the inner canthus; muco-purulent filaments and flakes were lingering in the lower fornix. The palpebral conjunctiva, as well as that of the fornix showed a well marked hyperaemia. The bulbar conjunctiva showed a few injection streaks.

A rhinitis with bilateral muco-purulent flow existed; a few dried secretions under the shape of brownish scurfs, covered the edges of the nostrils, that were obstructed by them. The subnostril skin was red and inflamed.

Owing to these symptoms, one would feel inclined to determine the diagnosis of lacrimal conjunctivitis neonatorum; but the lacrimal canal was perfectly permeable.

The conjunctival secretion contained a quantity of diphtherimorph bacilli, as well as a few cocci. Those bacilli were Loeffler's. They presented an irregular colouration and carried Neisser's bodies. They were easily grown in broth and on coagulated serum but with much more difficulty, on gelose. They did not coagulate milk, did not liquefy gelatine, and did not grow on potatoes. They throve in anaerobiose, caused glucose to ferment and produced acid in broth. But they were not possessed of any haemolytic power.

When injected under the skin of a guinea-pig, weighing 315 gr., 0·5 c.c. of the broth culture, 24 hours old, produced, at the point of injection, a subcutaneous and viscous oedema, which was followed by an eschar, that disappeared after a time. The guinea-pig presented some symptoms of toxi-infection; prostration, progressive loss of weight (up to 55gr.), rise of temperature (up to

39°C.2). The animal recovered completely after three weeks, having nearly recuperated the whole of its initial weight.

The same microbian injection having been applied to a guinea-pig, that had previously been rendered immune by an injection of antidiphtheritic serum, was followed by no phenomena, either local or general.

The cocci were pneumococci; they were Gram-positive diplococci; they grew better on gelose-serum, whereon they produced transparent and dot-shaped colonies. They did not liquefy gelatine and did not develop on potatoes. They coagulated milk at the end of six days. In broth they caused a slight cloud, that disappeared by way of sedimentation. Ox-gall caused their dissolution and a 1 c.c. injection of microbian emulsion caused the death of a mouse in 48 hours.

The culture of the nasal and pharyngeal exudation of the child showed common micrococci.

Consequently, the baby had caught a unilateral diphtheritic conjunctivitis of a catarrhal type.

Serotherapy without any local treatment was applied. On November 21, we effected a subcutaneous injection of 5,000 units of antidiphtheritic serum and, on November 22, a fresh injection was done. On November 23, the conjunctivitis was entirely cured and the rhinitis considerably improved. On November 25, the rhinitis itself was totally cured.

Case 5.—On March 5, we were brought a young boy, aged one month. About a week after the child's birth, a conjunctivitis declared itself and remained stationary, notwithstanding argyrol instillations. At the same time, a rhinitis, that was dealt with without any success by means of eucalyptol, began to affect the baby.

The examination of the eyes proved the existence of a catarrhal conjunctivitis; the lashes were sticking into brushes by a yellowish and muco-purulent secretion; some lashes were covered with small brownish and dirty concretions. Some dirty yellow muco-pus, under the shape of a biggish clot, had accumulated in the inner canthus of the eye. When we everted the lower fornix, we found muco-purulent filaments in it.

The palpebral conjunctiva and that of the fornix was obviously congested. On the bulbar conjunctiva we saw some distended vessels in the form of radial streaks. The skin of the lids presented a diffuse erythematous colouration that was accentuated near the free edges.

On either side there was a small preauricular adenopathy having the volume of a small pea. It was hardly visible, but easily discernable under the pressure of a finger.

We also noticed rhinitis; there was rather an abundant bilateral nasal muco-purulent flow; breathing through the nose was noisy and difficult; the free edge of the nostrils was covered with brownish and dirty scurfs. Under the nostrils the skin was erythematous and showed a crescent-shaped erosion.

The microscopic examination of the conjunctival secretion showed a number of diphtherimorph bacilli and a few cocci. Cultures on solidified serum gave two kinds of colonies: white-greyish, opaque, dot-shaped colonies, which were the more numerous and contained diphtherimorph bacilli; and three bigger colonies, 1 mm. diameter, China-white and containing cocci.

The diphtherimorph bacilli were Loeffler's; they fixed the colouring matter in a fragmentary way and were carrying polar bodies. They grew easily on solidified ox-serum, but with more difficulty on gelose. They did not liquefy gelatine, did not grow on potatoes and did not coagulate milk. They produced a cloud and acidity in broth. They developed in anaerobiose and caused glucose to ferment. They had haemotoxic properties.

Under the skin of a guinea-pig of 365 gr., we injected 0·5 c.c. of the broth culture, 24 hours old. A viscous oedema was rapidly produced at the point of injection; temperature rose to 39·6°C.; the animal became motionless, oppressed, dyspnoeic and died at the end of six days. The post-mortem examination enabled us to establish, besides the subcutaneous, gelatinous oedema at the point of injection, the presence of marked congestion of the viscera, principally of the suprarenal capsules; the ganglions were hypertrophied and an abundant effusion existed in the pleura and pericardium.

The inoculation of the same microbian culture, applied to a guinea-pig, that had previously been rendered immune by means of an injection of antidiphtheritic serum, was not followed by any local or general reaction.

The cocci were white staphylococci. They were Gram-positive, spherical and grouped into clusters. On gelose, they gave a few roundish, opaque, damp, slightly granular and China-white colonies. They liquefy gelatine. In broth and milk they developed a special sour odour. An 0·5 c.c. injection under the skin of a rabbit caused an abscess that healed after having burst externally.

The catarrhal conjunctivitis of the child was consequently due to Loeffler's bacillus, associated with the white staphylococcus.

The rhinitis was also of a diphtheritic nature, as we had, on the level of the nose, found a diphtherimorph bacillus, the cultural and morphologic characters, as well as the biochemical and virulence of which caused it to be identified with Loeffler's bacillus.

The cultures of the pharyngeal exudation of the child gave only common micrococci.

It is to be noted that a brother, aged 4 years, had a pseudo-membranous diphtheritic angina, when the conjunctivitis of the baby began.

In this case we injected antidiphtheritic serum without any local treatment. On March 7, an injection of 5,000 units was effected and repeated on March 8. On March 9, both conjunctivitis and rhinitis were quite cured.

Symptoms

Catarrhal diphtheritic conjunctivitis is principally found in newly-born children and usually begins in the first days that follow birth. In four of our cases, the affection began within a week; in the first case, the original date is more difficult to determine.

In most cases it is bilateral, but may be unilateral, as was the case in our fourth observation. The second eye may be attacked rather rapidly; in three of our cases, both eyes were attacked at the time of our first examination. It is also apt to be attacked much later; in our first case, the conjunctivitis of the right eye seems to have begun six weeks after that of the left eye.

The objective symptoms of catarrhal diphtheritic conjunctivitis are:—

1. *Muco-purulent secretion.*—A canary-yellow muco-purulent secretion, which is sometimes merely glairy and filamentous, is the principal sign. It agglutinates the eyelashes during the night and in the morning a moderate effort is necessary to open the lids, the lashes of which stick together, and near whose roots small yellowish concretions are to be seen. In the daytime, the lashes are sticking into brushes and the conjunctival secretion collects in the inner canthus under the form of a small and often vivid yellow clot. When everting the lower fornix, one always observes a few yellowish muco-purulent filaments and flakes. This secretion is rapidly replaced and a short time after the cleansing of the conjunctival sac fresh muco-purulent concretions reappear therein.

2. *Conjunctival hyperaemia.*—The bulbar conjunctiva is slightly blood-shot, red streaked and more lubricated than usual, which gives the eye rather a watery aspect. The palpebral conjunctiva and that of the fornix is rather strongly congested; it may be swollen and have a granular aspect, as in one of Sourdille's cases; no follicular productions are ever found in it.

3. *Palpebral erythema.*—To the conjunctival phenomena, we must, in the very first instance, add some palpebral symptoms; one may observe a diffuse erythematous colouration that spreads over all the cutaneous region of the lids; sometimes it is more

acute on the side of the free edge. One may also notice rather a discrete oedema of the upper lid and even of the lower one.

4. *Preauricular adenopathy.*—There often exists a preauricular adenitis of the volume of a small pea. One may feel it rolling under one's finger, as observed in four of our cases.

5. *Rhinitis.*—Catarrhal diphtheritic conjunctivitis often goes on a par with rather an accentuated rhinitis, that inconveniences the nursling even to the extent of preventing it from feeding normally. We have observed this rhinitis in every one of our cases; it is characterized by a muco-purulent nasal flow of variable importance, by a stoppage in the nose, by brownish scurfs of dried secretion, which cover the edges of the nostrils and may even obstruct the same. This rhinitis causes an irritation of the free edge of the nostrils and of the subnostril region. This irritation shows itself under the form of erythematous spots, fissures and erosions.

At times, catarrhal diphtheritic conjunctivitis has an aspect of xerosis, as observed in our first case.

Between the pure catarrhal form of diphtheritic conjunctivitis, as just described, and its more characteristic pseudo-membranous form, there are intermediate clinical aspects; such is Sourdille's case, in which, besides some symptoms of muco-purulent conjunctivitis, there was a very small pseudo-membrane overlapping the fornix in the centre of the lower palpebral conjunctiva.

Diagnosis

Catarrhal diphtheritic conjunctivitis is none too characteristic. It has no pathognomonic signs and its symptoms are to be met with in many a conjunctivitis of another nature. However, the following observations ought to put us on our guard.

1. *Inefficacy of the ordinary treatment.*—Catarrhal diphtheritic conjunctivitis shows little natural tendency to healing; it has a chronic evolution and resists the usual treatment by means of instillations and ointments. We have been able to verify the fact in all our observations. This is in accordance with Ginestous' opinion concerning two cases he studied.

2. *Efficacy of antidiphtheritic serum.*—The antidiphtheritic serotherapy gives a rapid and complete cure. In all our cases two injections of 5,000 units of antitoxic serum have given a perfect cure within a few days (usually three to four).

3. *Coexistence of a rhinitis.*—Catarrhal diphtheritic conjunctivitis nearly always goes on a par with a persistent rhinitis, which resists all treatment but antitoxic serotherapy. Besides, Morfan and Chevalley have proved that there exists a pseudo-membraneless nasal diphtheria, which, in most cases, affects newly-born

children and is even the most usual form of diphtheria at that age; it is a common coryza irritating the free edge of the nostrils and the subnostril region. The coexistence of this fissure characterized coryza must, according to Grenet's opinion, cause us to think of a conjunctivitis of a diphtheritic nature.

4. *Presence of a preauricular adenitis.*—The fact is of importance in the diagnosis of a diphtheritic conjunctivitis with catarrhal form; it is almost constant in this case, whilst it is only exceptional with certain common conjunctivitis such as pneumococcic or Morax-Axenfeld conjunctivitis.

5. *Commemoratives.*—The study of commemoratives is apt to furnish us with valuable information. For instance, in one of Sourdille's cases a woman contracted a diphtheritic catarrhal conjunctivitis from her children, who were also suffering from a pseudo-membranous diphtheritic conjunctivitis. In our first case, the midwife, who had lived for 20 days near the child, had also had a marked angina; both the mother and the grandmother had complained of a slight sore throat. In our last case, the child's brother had contracted a pseudo-membranous diphtheritic angina. All our nurslings originated from a district where diphtheria exists in an endemic state and where a recrudescence of epidemy was noted at the time of our studying the above mentioned conjunctivitis.

Complications

As the pseudo-membranous form, so the catarrhal form of ocular diphtheria may be complicated with corneal lesions, as observed in our first case.

Aetiology

Catarrhal diphtheritic conjunctivitis is due to the pullulation of Klebs-Loeffler's bacillus in the conjunctival sac.

1. *Age.—While it is apt to be found at any stage of life, even* in adults; as in Guilbert's and Sourdille's cases, it is nearly *always noticed to attack newly-born babies or nurslings.* Our own five observations, Chartres' three and Ginestous' two are the proof of what we do not hesitate to assert.

2. *Epidemicity and contagion.*—Catarrhal diphtheritic conjunctivitis is only met with in a sporadic state. All our patients came from a locality where diphtheria exists in an endemic state and where there was a recrudescence of the epidemy at the time of the outbreak of their conjunctivitis. We have only found two cases in the same family (cases 2 and 3).

Twice only have we been able to establish the origin of our nursling's contamination (cases 1 and 5); it was a diphtheritic

angina, probably in the former case, but certainly in the latter. In Sourdille's case, the patient had been contaminated by her children, who had caught a pseudo-membranous diphtheritic conjunctivitis.

3. *Is catarrhal diphtheritic conjunctivitis a primitive or a secondary diphtheritic localization?*—It may be primitive. But it often follows a nasal diphtheria, the infection growing gradually through the lacrimal canal; it seems that such was the case with our patients; the fact that it was impossible to find Loeffler's bacillus in the nasal secretions cannot be evidence against this theory, as it is not always possible to isolate the diphtheria bacillus; on the other hand, the quick healing of our nurslings' rhinitis overcome with serotherapy, constitutes an argument on behalf of the diphtheritic nature of their coryza.

4. *Is catarrhal diphtheritic conjunctivitis a primitive or additional infection?*—It may be primitive; our third observation proves it, because Loeffler's bacillus was existing alone.

It may also be an additional infection; in our second observation, the pneumococcic congenital dacryocystitis, which was probably primitive, has enhanced the further infection by the diphtheria bacillus.

5. *Can Loeffler's bacillus grow alone in the conjunctival sac?*—We do not hesitate to answer in the affirmative; our third case is a proof thereof. Besides, Trapezontzewa has effected the same observation three times out of 11 cases of diphtheritic conjunctivitis. However, those facts rather constitute an exception. Morax even believes that they do not exist.

6. *Loeffler's bacillus is generally associated with other micro-organisms.*—We have once found it associated with white staphylococcus and three times with pneumococcus. Those microbes may remain harmless or add their pathogenic action to that of the diphtheria bacilli. It seems that in our cases, the associated microbes were really pathogenic, for, if they grew less abundantly than the diphtheria bacillus, they were not less virulent for experimental animals. Most probably it is owing to the pneumococcic association that we may account for the serious evolution of our first patient's corneal ulcer.

7. *Why does Loeffler's bacillus sometimes cause only a catarrhal conjunctivitis, when it more often gives birth to a pseudo-membranous conjunctivitis?*—This fact seems, on one hand, to be dependent on an attenuation of the virulence of the diphtheria bacillus, and on the other hand, on the nature of the microbe that is associated to it.

(*a*) In the muco-purulent conjunctivitis that we have observed, the virulence of Loeffler's bacillus was attenuated; its pathogenic action for the guinea-pig had, indeed, sensibly diminished and

was, in three cases, hardly evident; besides, that observation was in accordance with the fact that the observed diphtheria bacillus belonged to the middle kind, which according to Martin and Sourdille, is less virulent than the long sort.

Now since the experiments of Coppez, Morax and Elmassian, Roger and Bayeux, it is known that the pseudo-membranes are due much more to the toxin secreted by the diphtheria bacilli, than to the bacilli themselves. Consequently, we think that it is to the attenuation of the bacilli's virulence, and subsequently to a lesser production of toxins, that the absence of pseudo-membranes in our cases and their evolution under the shape of catarrhal conjunctivitis should be attributed.

(*b*) The association of pneumococci or staphylococci with Loeffler's bacilli seems to give the conjunctivitis a more benign physiognomy than the association of other micro-organisms, streptococci, for instance. Sourdille had already observed that the pseudo-membranous form itself was considerably less serious, when the diphtheria bacillus was accompanied by staphylococci than when it was associated with streptococci.

Prognosis

The prognosis of catarrhal diphtheritic conjunctivitis depends upon the precocity of the diagnosis and of the serotherapy. When carelessly attended to, it becomes chronic, lingers and may acquire corneal complications that are sometimes quite serious (case 1). On the contrary, under the influence of antidiphtheritic serum, it heals very quickly and, for our first patient, we may wonder whether adequate treatment could not have prevented the corneal ulcer, should we have been able to establish the aetiological diagnosis of the ocular affection sooner.

Treatment

No local treatment is to be instituted. Antidiphtheritic serotherapy is sufficient; as early as the day after the first injection of antitoxic serum, the conjunctival secretion dries up and a complete healing happens on the third or fourth day.

Twice in two days running we injected 5,000 units of antidiphtheritic serum under the skin. From our experience, this quantity should be sufficient, even when the case is complicated with corneal lesions. However, should the improvement not be manifest after the second injection, there is nothing to prevent us from effecting a third and even a fourth injection. Nevertheless, we think it useless to resort to bigger doses, the quantity of toxin absorbed being probably rather small.

The eventual corneal complications are treated, together with the causal general condition, by means of antiseptic bandages, and either mydriatics or miotics, according to circumstances.

Discussion

When perusing the ophthalmological literature, we observe that several authors have written about catarrhal diphtheritic conjunctivitis without having gone thoroughly into the subject.

As early as 1893, Guilbert conjectured the possibility of a catarrhal form of diphtheritic conjunctivitis when studying a case of chronic pseudo-membranous conjunctivitis "that was affecting a girl, aged 7 years, who, since the age of 3 months, had always had skins and pus in the left eye and whose right eye had been infected in December, 1892. At intervals, the pseudo-membranes disappeared, but even then a purulent secretion subsisted."

The first observation of catarrhal diphtheritic conjunctivitis is due to Sourdille in 1894. Mme. V. was the mother of a child, aged 4 years, who presented a serious interstitial diphtheritic conjunctivitis with corneal complications, perforation of the cornea and subsequent phthisis bulbi. Another of her children, a girl, aged 2 years 6 months, had also shown a serious interstitial diphtheritic conjunctivitis, complicated by corneal lesions of the right eye. She came to the doctors on July 17. For four to five days her left eye had been slightly sore; it was then red and watery; the lids were hardly swollen. The conjunctiva of the lower lid was swollen, granular and red; in its centre and overlapping the fornix was a small pseudo-membrane, which disappeared two days later. For the rest, there simply existed a filamentous, glairy secretion, out of which it was possible to isolate a virulent diphtheria bacillus.

Uhthoff, von Hippel, Pichler, Chartres, Coppez, Ginestous and von Herrenschwand have reported similar facts.

In a conjunctival inflammation, Uhthoff has been able to isolate a virulent diphtheria bacillus, whilst there was no sign of any pseudo-membranes.

Pichler has inspected the eyes of certain children who were accompanying to the doctors their brother and sister who were suffering from pseudo-membranous conjunctivitis; these children either had sound eyes, or complained only of a slight burning sensation. Every time Pichler found moderately virulent Loeffler's bacilli in the conjunctival sac, but he could not obtain more than three to five colonies per plate. These diphtheria bacilli disappeared rather quickly after the recovery of the other members of the family.

E. Chartres has found the diphtheria bacillus alone in three cases of ophthalmia neonatorum.

H. Coppez writes that if Loeffler's bacillus can produce a superficial or interstitial pseudo-membranous conjunctivitis, it can also cause a mere catarrhal conjunctivitis.

E. Ginestous has observed two cases of ophthalmia neonatorum affecting a merely purulent form, without any pseudo-membranes, but undergoing an abnormal evolution and refractory to the usual treatment and silver instillations. The bacteriological examination of the conjunctival secretion proved that it was a question of middle and long bacilli diphtheritic conjunctivitis, and that the antitoxic serotherapy produced a rapid cure.

von Herrenschwand writes that Loeffler's bacillus can cause simple catarrhal conjunctivitis without any pseudo-membranes, which are distinguished with difficulty from other muco-purulent conjunctivitis due to another microbian cause.

Pes says that when examining 75 cases of acute conjunctivitis he found Loeffler's bacillus 20 times, either alone, or associated with Weeks' bacillus. These assertions should only be accepted reservedly, for a confusion with the xerosis bacillus may have taken place, the more so as the identification proceedings have been insufficient. Besides, Kuschbert-Neisser's bacillus quite often accompanies Weeks' bacillus and grows so easily in the cultures of the latter, that it is quite apt to screen the real pathogenic agent; that is the reason why Morax has only been able to obtain pure cultures of Weeks' bacillus after many attempts.

V. Morax thinks that the facts, which advocate on behalf of the existence of a catarrhal conjunctivitis of a diphtheritic nature, are not sufficient. He raises the following objections:—

1. *Virulent diphtheria bacilli are sometimes found on the conjunctiva, even in the absence of inflammatory phenomena.*—Certain germs, like pneumococci and staphylococci, can live as simple saprophytes in the conjunctival sac and can, at a given moment, resume their pathogenic action to cause a muco-purulent conjunctivitis and even a pseudo-membranous one. Why, then, would it be surprising that Loeffler's bacilli might occasionally be a harmless guest of the conjunctiva, and at other times cause a conjunctivitis, which, according to circumstances, will be catarrhal or pseudo-membranous?

2. *The diphtheritic process rarely evolves in a pure state; most commonly, it goes on a par with another infection, which is much more contagious, and plays the part of bait. We are consequently entitled to wonder whether the fact that the pseudo-membranes have not developed, is not the sign of a lack of proliferation of the diphtheria bacilli, which, however, may exist in units on the conjunctiva.*—To this objection, we may answer:

(*a*) There are cases of catarrhal diphtheritic conjunctivitis in which Loeffler's bacillus is in a pure state (our case 3 and Chartres' cases).

(*b*) Certain cases of conjunctivitis, even those in which the diphtheria bacillus is associated with other germs, are complicated with corneal lesions, which can only be accounted for through the intervention of Loeffler's bacillus (case 1).

(*c*) Loeffler's bacillus, found on our patients, was virulent, as was the case with Sourdille's and Uhthoff's bacilli.

(*d*) Catarrhal diphtheritic conjunctivitis is refractory to the ordinary medical cure, but on the contrary, rapidly disappears by means of the antitoxic serotherapy, which does not possess the same favourable action on the muco-purulent conjunctivitis of another nature.

3. ***It may also be supposed that the small quantity of toxin, secreted by the diphtheria bacillus, has not been sufficient to determine the production of a pseudo-membrane.***

This suggestion is by no means an objection to the existence of a catarrhal diphtheritic conjunctivitis; on the contrary, it seems that it is the very explanation of its possibility; we have, indeed, shown that the diphtheria bacilli, under review in our cases, presented a diminished virulence.

Besides, the existence of a catarrhal form of diphtheritic conjunctivitis must not surprise us, as the studies of Koplich, Goldscheider, Feer, Aviragnet, Le Soudier, and others, have shown us that there are pseudo-membraneless diphtheritic anginas and even simple erythematous ones.

There are also pseudo-membraneless nasal diphtherias, manifesting themselves under the form of a muco-purulent coryza, as Hutinel's, Grenet's and Lesné's, Marfan's and Chevalley's studies have ascertained.

Conclusions

1. Besides the pseudo-membranous forms of diphtheritic conjunctivitis, there is a mere catarrhal form.

2. The latter is often met with in newly-born children and should be ranked among the ophthalmias neonatorum.

3. It shows no pathognomonic sign and has the aspect of nearly all muco-purulent conjunctivitis.

4. Because of its clinical aspect, it seems to be the most benign of all diphtheritic conjunctivitis; however, it may be complicated with serious corneal lesions.

5. It is refractory to the ordinary treatment, but it heals completely and rapidly under the influence of antidiphtheritic serotherapy.

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DISTURBANCES OF THE VISUAL APPARATUS IN THE TOXAEMIAS OF PREGNANCY ASSOCIATED WITH ECLAMPSIA OR THE PRE-ECLAMPTIC STATE

BY

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IN November, 1933, the first-named writer saw in consultation with Dr. Narayanaswami Pillai of the above hospital a case of "blindness following eclampsia." "A" was a Hindu, aged 18 years; 18 months before she was nearing full term as a primipara. She had been a big strong healthy girl and never suspected anything wrong till she got fits near the time of her delivery. They were not bad and she consulted Colonel Hingston, at that time Superintendent, Madras Government Hospital for Women and Children. He

treated her by the veratrone method, then in routine use in his hospital. She was delivered, and after delivery she had very severe fits. She rapidly became blind and a condition of general muscular paresis, loss of sphincteric control, and mental apathy set in. Her child died in three months, but she did not realise what had happened. Gradually her muscle power came back. She began to speak to her relatives and take an interest in things. To all intents and purposes she regained her previous mental and physical vigour, but she remained blind. On examination, vision = H.M. both eyes, pupils round, about 4 mm., reacting sluggishly to light and accommodation. The fundi on either side were absolutely normal in every respect. The urine and blood pressure were reported normal. The diagnosis seemed to be between psychic blindness, this type is not very uncommon here, and a lesion above the third neurone resulting from pregnancy toxaemia. After a careful examination a psycho-neurotic amblyopia seemed improbable and a lesion of the upper neurone attributable to eclampsia was diagnosed. She was three months' pregnant, and, disappointed with western medicine she employed practitioners of indigenous medicine for her second pregnancy. They appeared to stake all on a psychic lesion and assured her that she would recover her sight on being delivered of her second child. With the help of Dr. Narayanaswami Pillai, who has kept in touch with the case, we now know that she was delivered of a child at full term in July this year. There were no fits, nor was there any change in the vision. No record is available of blood pressure or urine examination at this time.

The case was very interesting and we do not remember having seen one exactly like it previously, that is to say, a case in which the vision had been seriously interfered with in an eclamptic without any evidence whatever of an injury at the retinal level. Colonel Hingston and Dr. A. Lakshmanaswami Mudaliar have permitted us to say that they do not remember having seen a similar case in the last decade. Their experience of eclampsia at the Government Hospital for Women and Children is extensive as may be seen from the reports of this institution. In the last 10 years there were 31,520 pregnancies and 1,199 eclamptics or pre-eclamptics. It is possible, of course, that they may have missed cases of this type in hospital practice, as patients with serious defects of vision associated with pregnancy not uncommonly take their discharge from hospital very soon after delivery, and systematic ophthalmoscopic examination of such women has not been a routine in that hospital. Some post-eclamptics come our way on account of the proximity of the two institutions. Heretofore in the serious defects of vision following toxaemias of pregnancy we have always observed some fundus change, but it does not follow that patients

affected like "A" have not escaped our observation. In one other case at least, referred to us by Dr. P. Jeffery of the Vellore Medical School for Women, there appeared to be an injury at this level from which the patient gradually recovered without residual changes in the eye grounds, but we will not quote it in detail as malaria and quinine were also possible toxic factors.

Some years ago the late Dr. V. G. Muthayya, at that time in charge of the refraction room of this hospital, undertook at my request to examine the fundi of such cases of eclampsia as were reported to us from the neighbouring Government Hospital for Women and Children. How many cases were observed by Dr. Muthayya is not known—he became ill and died, and his records were lost. He probably did not see more than 20 cases, and our general impression, from verbal communication, is that the bulk of them presented fundi within normal limits. In view of the above, we decided to undertake a fresh series of observations. By the kindness of Colonel C. M. Plumptre, Dr. A. Lakshmanaswami Mudaliar and Dr. Achutha Menon of the Government Hospital for Women and Children, we were given telephonic advice of the admission of patients to the eclampsia wards. We shared the labour of making ophthalmoscopic observations, and long experience of working together has enabled us to attain a practical degree of uniformity in interpreting fundus appearances. It was not possible to see these patients beforehand nor to follow them up after discharge except in a few instances. We saw a series of 27 cases, 28 including case "A," the details of which are conveniently shown in the attached table. It will be noted that there is no record of the state of the urine or blood pressure before admission; this is regrettable, but unavoidable in hospital patients here. A clinical observation of this sort would be more valuable if it were known in how many instances the kidney function was normal before the pregnancy, or, at what stage, if at all, it became impaired, also at what period the blood pressure showed evidences of variation. It was not our intention, however, to make an exhaustive enquiry, but to make a clinical record of the more obvious eye lesions. The first thing that strikes one in the series is the absence of any case of detachment of the retina. In ophthalmic literature the occurrence of detachment in eclampsia has received considerable attention, although it is relatively infrequent. Clapp (in the *Amer. Jl. of Ophthal.*, July, 1919) gives his experiences in Baltimore where he observed six cases of detachment in less than two years, but in the previous 14 years had not seen a case. The number of cases of eclampsia observed is not given. Schiötz found seven instances in 158 eclampsia and threatened eclampsia cases (*Klin. Monatsbl. f. Augenheilk.*, 1921). If we assume that Dr. Muthayya saw 10 cases without an instance of detachment (and we

SYNOPTIC TABLE OF 28 CASES OF ECLAMPSIA OR PRE-ECLAMPSIA

Date	Case	Age	No. of pregnancy	Fits	Albumin on admission	B.P. on admission and after	Oedema	Term of Pregnancy	Eclampsia or pre-eclampsia	Delivery	Ophthalmoscopic appearances. With few exceptions one short examination only
1934	A	18	1st	Few mild before, several severe after delivery	No record	No record	No record	Full term	E.	Delivered live child	Normal
Feb. 18	1	29	3rd	1 four days after admission	+ +	140	Legs +	26th week	E.	Left hospital before delivery	Within normal limits
Feb. 18	2	20	2nd	Nil	+ +	160—later 90	Abdominal walls and face +	24th ,,	Pre.	Feb. 29. Male child, died same evening	Within normal limits
Feb. 27	3	17	1st	6 fits before admission, fits continued after admission	+	130, 130 3rd day, slow fall	Legs +	Not noted	E.	Mar. 2. Asphyxiated male child, revived	*
Feb. 22	4	18	1st	3 before admission 2 after admission	+ + +	130—later 100	Nil	30th week	E.	Feb. 23. Still born premature	†
Feb. 26	5	21	2nd	Nil	+ +	140—130 later, slow fall	Feet and abdominal walls +	Full term	Pre.	Mar. 4 Male child alive	Within normal limits
Mar. 1	6	17	1st	Some before and some after admission	+	160—later 136	Legs and abdominal walls +	36th week	E.	Mar. 2. Female child alive	Within normal limits except peripapillary greyness. Oedema?
Mar. 8	7	25	6th	Nil	+ + +	140—last entry 90	Generalised	32nd ,,	Pre.	Mar. 12. Female child alive	Within normal limits
Mar. 9	8	20	1st	Nil	+ +	100	Feet +	32nd ,,	Pre.	Mar. 16. Female child alive	Within normal limits
Mar. 10	9	22	2nd	1 before admission 3 after admission	+	150—fell to 80	Nil	Full term	E.	Mar. 10. Female child alive	Within normal limits
Mar. 13	10	18	1st	3 before admission 3 after admission	No record	160—fell to 80	Face +	32nd week	E.	Mar. 14. Macerated foetus	Within normal limits
Mar. 18	11	28	6th	Nil	+ +	180—later 130, later 160	Lower extremity +	28th ,,	Pre.	Mar. 15. Macerated foetus	Within normal limits except slight peripapillary greyness. Oedema?
Mar. 21	12	30	3rd	Nil	+ +	140—later 90	Not noted	32nd ,,	Pre.	Apl. 1. Male child living	Slight peripapillary greyness, otherwise normal
Mar. 21	13	33	9th	Nil	+ +	120	Legs +	36th ,,	Pre.	Mar. 22. Still born	Within normal limits
Mar. 26	14	25	7th	Nil	+	175—later 130	Legs and abdominal walls +	28th ,,	Pre.	Mar. 28. Foetus expelled, baby died	Within normal limits

Date	Case	Age	No. of pregnancy	Fits	Albumin on admission	B.P. on admission and after	Oedema	Term of pregnancy	Eclampsia or pre-eclampsia	Delivery	Ophthalmoscopic appearances. With few exceptions one short examination only
1934											
Mar. 27	15	25	3rd	Nil	++	165—later 110	Legs +	28th week	Pre.	Mar. 29. Child died Mar. 31	Within normal limits
Mar. 29	16	35	13th	Nil	+++	160—later 110	Nil	22nd ,,	Pre.	Apl. 5. Complete abortion	Capillary tortuosity, otherwise normal
Apl. 8	17	20	1st	Nil	++++	120—later 90	Feet and face +	32nd ,,	Pre.	Apl. 10. Macerated foetus	Peripapillary greyness. Oedema? Otherwise within normal limits
Apl. 11	18	26	2nd	Nil	+++	140—later 120	Lower extremity +	32nd ,,	Pre.	Left hospital before delivery	Within normal limits
Apl. 10	19	30	5th	5 at home, 2 after admission	++++	130—later 120	Legs and abdominal walls +	36th ,,	E.	Apl. 11. Still born female child	‡
June 2	20	28	7th	Nil	+	185	Legs and abdominal walls +	—	Pre.	—	Within normal limits
June 8	21	37	6th	Nil	No record	230—later 145	Nil	14th ,,	Pre.	June 8. 4½ months' foetus passed	Within normal limits
June 16	22	22	Not noted	6 at home, 2 after admission	+++	110—later 70	Face +	Admitted 6 hours after delivery	E.	June 16. Delivery at home	Within normal limits
June 19	23	25	1st	Nil	++	120—later 120	Generalised	36th week	Pre.	Patient died before delivery June 21	§
June 20	24	28	8th	Nil	Trace	180—later 100	Nil	Full term	Pre.	June 20. Forceps, female child alive	Within normal limits
June 21	25	35	1st	5 at home, 2 after admission	+	95	Nil	Full term	E.	June 21. Female child alive	Within normal limits
July 1	26	35	2nd	1 fit	+++	140—later 60	Slight	26th week	E.	—	Within normal limits
July 2	27	30	3rd	Nil	+++	150—later 120	Legs and abdominal walls +	32nd ,,	Pre.	July 2. Child alive	Within normal limits

Notes referring to the above table:—

*Case 3.—Observed immediately prior to, during, and after her 2nd post admission fit. Eye grounds within normal limits. During the fits the veins became increased in diameter more tortuous, engorged and darker; banked up at arterial crossings. There appeared to be an increasing pallor of retina, but maculae could not be observed owing to the patient's movements. It is not possible to say if arteries slightly narrowed or went into some degree of tonic spasm. They appeared to be narrowed and have a higher reflex, but as the veins became fuller this may be a false impression. A graticule was not used. The maculae were normal immediately before the fit and again after when it was possible to see them. The patient was not seen a second time.

†Case 4.—18 days after admission patient complained of absolute loss of vision. Fundus normal 24 hours later. Four days later able to distinguish light. Vision improved gradually. See text.

‡Case 19.—April 12, 1934. Disc and surrounding retina oedematous, arteries narrowed, patch of haemorrhage below right disc, left eye similar without haemorrhage. On April 23, 1934, a haemorrhage left eye, below disc and near macula. Later not possible to make examination.

§Case 23.—Peripapillary oedema both eyes, patch of haemorrhage in inferior nasal quadrant of right eye.

Remarks:—

1. The greyness of the fundus associated with oedema is apt to be mistaken for a greyness which is a normal appearance in certain heavily pigmented eyes (such as in some Indian patients).

2. The nature of treatment is not given. For the most part magnesium sulphate treatment was used but veratrone was also administered in more severe cases. Nos. 3 and 19 had veratrone.

3. Complete records of the blood pressure were not obtainable: an approximate idea of the systolic pressures is given.

know that this is an underestimate from our conversations with him), we may say that in 37 cases of eclampsia and pre-eclampsia in Madras this complication did not arise. We do not propose to discuss the point, but would remark on the fact that the observation is in keeping with the relative infrequency of retinal detachment in all classes of Indian patients here.

In two instances (Nos. 19 and 23), there was obvious vascular damage as evidenced by recent retinal haemorrhage. In one of these, a young primipara (No. 23), it may reasonably be assumed that the disturbance was dependent on the recent pregnant state, and that she was unlikely to have had a residual lesion of the kidney or earlier retinal lesion. In the other case (No. 19), there had been previous pregnancies and the possibility of a residual kidney lesion, although there were no evidences of old retinal damage. We were particularly interested in looking for evidences of spasm of the retinal vessels in view of the modern conception of the rôle of spasm in the march of events resulting from these toxaemias which may ultimately involve the whole systemic arterioles in permanent damage. Only in one case were we able to see anything of this nature (if we except some appearances of oedema as indicative of temporary spasm), but this was the one case which we were able to observe in a seizure (No. 3). It is highly probable that we missed localized spasm of the arteries such as was described by Mylius and studied by Wagener (*e.g., Jl. of Amer. Med. Assoc.*, October, 1933) and others; time did not permit of prolonged and frequent observations. We might have been more fortunate in so far as the localized spasm is concerned had we been able to pursue prolonged and quiet observation rather than record the result of a hurried visit. We expected, but did not find, instances of obvious local or generalized spasm and oedema such as might account for the temporary depression in vision reported by obstetricians, and the permanent interferences with vision which we have sometimes observed as a sequel to eclampsia associated with late vascular fundus changes. The observations made during the seizure in one case (No. 3) are noted. It will be seen that they did not correspond with a severe generalized spasm such as occurs, for example, in a quinine idiosyncrasy, nor with the localized but definite contractions of the arterioles described in the recent literature. There was only one case (No. 4) of gross and prolonged interference with vision. When seen in the eclamptic ward at the time of admission this case showed a normal fundus picture. Seventeen days afterwards (March 9, 1934) she complained of complete loss of sight. On March 11, 1934 we got intimation of this event and on that day the fundi were normal, but there was no P. L. On the 12th the fundi were greyish, disc margins blurred, with marked temporal pallor and

peripapillary oedema. On March 22, 1934, she was admitted into the Government Ophthalmic Hospital. Right eye vision = fingers at 2 metres; left eye vision = fingers at 1·5 metres. Fundi showed left disc paler than right, arteries on both sides narrowed, but left narrower than right. She was discharged on April 3, 1934. Right eye vision = fingers at 2·5 metres, with −3 D. = 5/60; left eye vision = 5/60.

Fundi: Right eye. Disc pinkish within normal limits, arteries narrowed, no other change except that the foveal region showed a dull smoky appearance with loss of reflex. Left eye. Disc definitely pale, otherwise appearances same as right.

On July 18, 1934, the right eye vision = 6/60; left eye vision = fingers at 3·5 metres. The arteries were distinctly narrowed in both eyes, the left disc paler than the right, both showed a waxy yellowish pallor. The foveae showed some slight change on either side, loss of reflex, increased smokiness and fine mottling. The blood pressure was 110/70 mm. Hg, the urine free from albumin. The fields were markedly and concentrically contracted; no scotoma for white or colours. Whatever happened during the sudden loss of vision in this case, whether the retinal neurones were damaged by ischaemia secondary to the action of the toxin on the arterioles or by a direct poisoning of the ganglion cells, the late result resembles, in certain respects, the effects of a quinine amblyopia. The vision at first lost as a result of immediate injury was slowly regained in part, but not to the extent one sees in a quinine amblyopia. There was no central scotoma, but the fields were markedly contracted. The retinal vessels were narrowed and the disc showed a definite pallor. The immediate damage to the vessels was followed by permanent arteriolar sclerosis. Such late vascular changes presumably occur in greater or lesser extent when the action of the toxin on the arterioles is sufficient, apart from sudden losses of vision or obvious fundus changes during the toxic state. The less obvious degrees of spasm described in recent literature as of frequent occurrence in the toxaemias of pregnancy may ordinarily precede such permanent arteriolar contractions, but are not necessarily followed by them. The defect in the above case is obviously quite different in its location from that in case "A" described at the beginning of this article. The mode of production may have been the same, the damage to vision gross, but the level at which the injury took place different.

From this limited clinical record of South Indian eclamptic and pre-eclamptic patients the following inferences may perhaps be drawn:—

1. That practical blindness associated with normal eye grounds may follow the eclamptic state, the presumption being that the injury has acted at a higher level than the third neurone. This is

exceedingly rare here, only one other possible case having been observed in the last 15 years.

2. That loss of vision may also result from an injury acting at the retinal level either suddenly (usually recovered in whole or in part), or gradually and permanent (due to late changes in the vessels); this is not very rare.

3. That minor injuries may take place involving the retinal vessels as evidenced by haemorrhages, oedema and alteration in calibre of arteries and veins without immediate interference with vision; such are relatively common.

4. That the lesser spastic phenomena of the arteriolar tree described of recent years were probably missed, owing to the hurried nature of the ophthalmoscopic observation, rather than absent, on account of any peculiarity in the local conditions.

5. That detachment of the retina is probably very rare here as a sequel to the toxaemias of pregnancy; it has not been observed by us in this condition either in this series or on any previous occasion in the past 10 years.

ON THE STRUCTURE OF HERBERT'S PITS

BY

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REPORTING to the last Ophthalmological Congress in April, 1933, at Madrid, on a series of observations concerning the trachomatous lesions of the cornea, I maintained that the formations known as Herbert's pits consisted histologically in thickenings of the corneal epithelium which proliferated on those points where the nodules of trachoma had previously appeared.

During a subsequent communication, Pascheff expressed his surprise at such an interpretation being maintained. Owing to lack of time then, I was unable to discuss the matter further. Had I had time to discuss the subject on that occasion, I should have limited myself to stating that my views were based upon histological researches carried out on a number of pieces of cornea which I had removed from patients and had studied by means of serial sections. At the time it was impossible for me to furnish more convincing evidences to support the view that the thickenings I had taken as corresponding to the pits did really correspond to them. One of the photomicrographs which I had the opportunity of presenting to the Congress, is the one that is seen in Fig. 1. It was

made from a case of old trachoma undergoing an acute relapse. In this case there were nodules and Herbert's pits at the upper part of the limbus. At the distal part of the lunula a markedly thickened area of the epithelium may be seen which then was pointed out as belonging to a Herbert's pit found during a clinical examination by means of the slit-lamp.

FIG. 1.

Histological picture of trachomatous "pannus scleroticus" undergoing an acute attack. Material obtained by biopsy. The more marked infiltration is seen in area *a-b*, which corresponds to the "lunula." Towards both, the cornea and the bulbar conjunctiva the infiltration is not so marked. In *c* a nodule is seen which was also observed by means of the slit-lamp. In *d* a thickening is shown which corresponds to a Herbert's pit.

The above mentioned objection offered by Pascheff, as well as the fact that while studying the limbus region, both normal and pathological, thickenings of the epithelium which were afterwards met with, situated in between the papillary crest which is named "palisade," induced me to continue my researches, trying to work

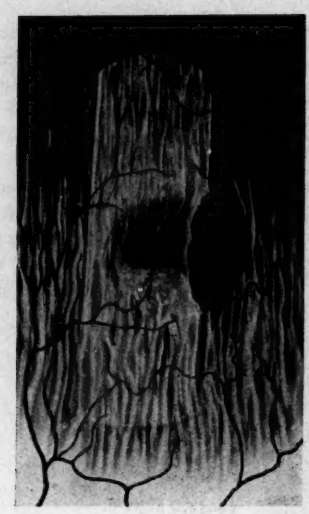

FIG. 2.

Herbert's pit as seen with the slit-lamp. Right eye: the light source comes from the temporal side. The temporal margin of the lighted prism is irregular at the point corresponding to the pit, and seems to follow the depth of the latter. With attentive observation it is seen that between the irregular line and the smooth corneal surface there is a zone apparently empty which is the result of the thickening of the epithelium.

FIG. 3.

Diagram showing a tattooed Herbert's pit. The Chinese ink is particularly dense at the periphery.

out a method enabling me to determine precisely in serial sections the exact seat of the tissues corresponding to the pit. This method was found and consisted in tattooing the pit, with Chinese ink, sometime before removing this part for microscopical examination. This procedure has proved a very satisfactory one as may be seen in this paper through the photomicrograph representing the pit which was removed a month after the tattooing was performed.

The anatomico-pathological findings, secured with this method, thoroughly prove my previous statements and furnish a further explanation for a number of peculiar facts observed when the slit-lamp is used.

Examining rather large pits (Fig. 2) by means of this apparatus I became convinced that there are no distortions of the prism caused by the bundle of light, and that under favourable conditions, at the lateral face of the prism, an apparently empty area is observed which is due to the abnormally developed epithelium, this one growing in order to fill up a lack of tissue existing underneath and having an irregular base.

At the proximal part it is easy to find what might be called the clear strips due to the tissues belonging both to the scleral and to the episcleral layers, which were destroyed.

In a moderately large pit, two little punctures were made with a tattooing needle with Chinese ink. A month later a small piece of cornea containing the pit was removed and examined microscopically. As is shown in Fig. 3, the Chinese ink used for tattooing remained at the periphery of the pit and in the central part of this a kind of deeply-stained navel-shaped depression was found with a number of strands irradiating from it. This material was cut in serial sections in a direction parallel to the corneal meridian; the examination of this material showed typical lesions which allowed me to confirm, without any doubt, both the facts I had previously stated concerning the existence of irregularities in the thickness of the epithelium at the exact seat of the pits and concerning the presence of epithelial proliferations filling up the empty areas left by the scleral, episcleral and corneal bundles which were destroyed due to the formation of the trachomatous nodules. According to these statements the epithelium was found in this case, clearly occupying all the anfractuosities resulting from the destruction of the bundles (Fig. 4).

These findings not only confirm my previous observations, but also enables us to explain the genesis of the Herbert's pits on an anatomico-pathological basis. As I stated in another communication, the trachoma nodules of the limbus begin at the distal margin of the "lunula," that is in the portion of the conjunctiva which takes place in the formation of the limbus region.

These nodules increasing push the vessels which are located at the sides; destroy only in that area the tissues, episcleral and scleral, which constitute the limbus region and go down to the corneal tissue, which is partially destroyed. Thus are formed round-shaped masses, which jut out a little or not at all above the corneal surface, and have a gelatinous appearance. They have a clear, rather yellowish colour, and are connected with small branches of blood vessels running in their neighbourhood. The new-formed

FIG. 4.

Serial sections of a Herbert's pit pointed out by tattooing. (*A*) Section lateral to the pit, where the epithelium has an almost uniform thickness. (*B*) Section corresponding to an anfractuosity of the peripheral part of the pit; an isolated island of epithelial tissue is seen which is not continuous with the superficial layer. (*C*) Marked thickening and irregularity of the epithelium at the central part of the pit. At the middle part of the thickening, epithelial cells are seen containing granules of Chinese ink; this point has a dark colour when examined by means of a slit-lamp. There is also a small central funnel-shaped depression. (*D*) Section medial to the anterior one. (*E*) Peripheral part of the pit. Slight thickening of the epithelium and unevenness of its surface.

vessels which come and go from the pannus of the cornea are seen passing through the interstices existing between the nodules.

When the process of recovery starts the nodules begin to re-absorb; the connective tissues situated between the nodules show a process of sclerosis, the blood vessels become smaller or are transformed in small compact strings and only a small number of the larger ones still remain partially open, furnishing blood from time to time.

As a consequence of the re-absorption of the nodular cells and owing to the scar-formation which takes place in a later stage there is a tendency for the cicatricial tissues to form depressions on their surface. However, no depressions at all are found due to the fact that the cells of the deeper layers of the epithelium increase in number and fill up completely the unevenness of the above mentioned depressions. The episcleral, scleral and corneal bundles which were once interrupted do not regenerate themselves and the

empty areas, formed on account of this lack of regeneration, become almost entirely occupied by the proliferated epithelial cells.

Considering that under optical examination these tissues appear empty, and that the opaque tissues (*i.e.*, episcleral and scleral layers) which normally take part in the formation of the limbus region are absent in the pits area, it results that the lamellae of the cornea are visible through the proliferated epithelium which lies behind. Due to this fact the area corresponding to the pits is more transparent than normal.

Keeping pace with the sclerosis of both tissues and vessels situated between the nodules, the opacity corresponding to these is increased and reaches also the normally transparent part of the cornea. All these facts result in the appearance of a characteristic picture. This picture is made up of festoon-like lines of a whitish colour, which lines circumscribe clearly (with the exception of the edge of the cornea) the round-shaped greyish areas, which, on a superficial examination, suggest the impression of a pit, while in reality this is not the case.

Only an exceptionally small central depression can be found at their centre. In conclusion it must be said that the name "pit" used to indicate the lesions considered does not express the real morphology of these formations.

TWO CASES OF RETINAL DETACHMENT PRESENTING CERTAIN UNUSUAL FEATURES AFTER OPERATION BY SURFACE DIATHERMY

BY

H. B. STALLARD

LONDON

IT occurred to me that certain features in the two cases of retinal detachment reported below might be of interest to some ophthalmic surgeons who are practising the surface diathermy technique of Larsson. Both cases were unsatisfactory during the immediate post-operative period of rest in bed in the appropriate position, the retina remaining detached, but later becoming completely replaced with full restoration of the visual field in each instance.

Case 1.—J. D., a boy, aged 13 years, was referred by his school doctor to the Moorfields Eye Hospital on account of defective left vision. He stated that this had been poor since some dirt had been thrown into his left eye four years ago. He had never worn glasses and was emmetropic in the right eye, the vision of which was 6/5.

The left eye proved subsequently to have 1·5 D. of hypermetropic astigmatism. The left vision was reduced to "hand movements" in the lower temporal part of his field. There was a retinal detachment occupying the position indicated in Fig. 1.

The macula was detached and presented a thin fenestrated appearance. At the ora serrata between "4.30 and 6 o'clock" there

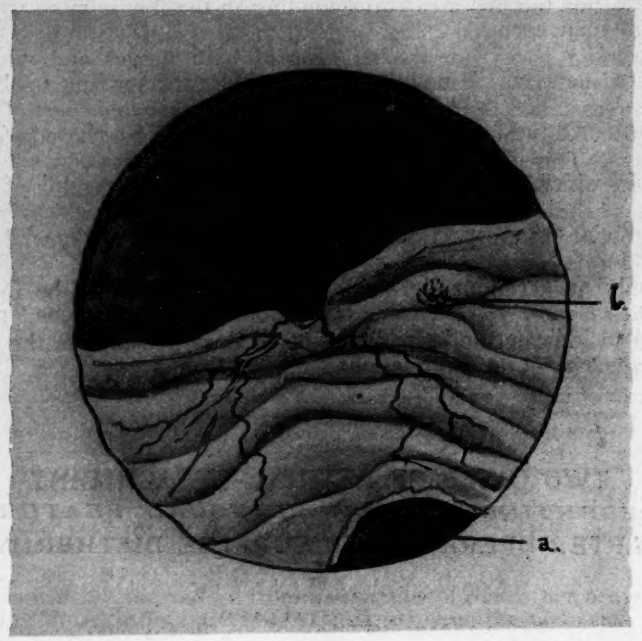

FIG. 1.

Diagram showing the site of the retinal detachment in Case 1.

a. Anterior retinal dialysis.
b. Detached macula presenting a thin fenestrated appearance.

was a large anterior dialysis with considerable retraction of the adjacent retina. Thin white lines, some running in the detached retina transversely from the optic disc above the macula and out towards the temporal side, and others along the course of the lower nasal branches of the central retinal vessels bore testimony to the long duration of the detachment. The detached area had an atrophic appearance. The vitreous was clear and of good quality as far as could be judged clinically.

On February 3, 1934, an operation was embarked upon with some misgivings, which were realized early in the proceedings by the hopelessness of attempting any operative manoeuvre under a local anaesthetic and by the subsequent violence of the patient during induction under a general anaesthetic.

The operation was completed uneventfully, diathermy applications being made 3 mm. apart over a band of sclera extending from " 4.30 to 6.30 o'clock " and at a depth between 8·5 and 15 mm. behind the corneo-scleral junction. The inferior rectus muscle was retracted to gain access to that part of the sclera which it covered. A 1·5 mm. trephine hole was made at the temporal edge of the inferior rectus muscle about 12 mm. behind the limbus; inter-retinal fluid was evacuated and the conjunctival incision sutured.

Post-operative convalescence was marked by the patient's turbulence and restlessness. Reasoned argument, persuasion and attempts to exert restraint failing in turn we abandoned them and after a few days allowed him to move about as he wished.

On the 17th day after operation he was discharged from hospital. The anterior dialysis was occluded by white fluffy exudate and there was some inflammatory reaction in the choroid at the diathermy points, but the retina was detached and at this time I had the impression that the inter-retinal (sub-retinal) fluid was greater in volume than before the operation.

Three weeks after operation this state of affairs was unchanged, except that there was some scar-tissue formation in the vicinity of the anterior dialysis and at the diathermy points adjacent to this.

He re-attended the out-patient department three weeks later (six weeks after operation) with the retina completely replaced, the anterior dialysis closed and good choroido-retinal adhesions at the diathermy sites. The macula was replaced, his visual acuity was 6/36, and the visual field full. The area of the retina which was formerly detached was clearly marked off from the remainder by having a faintly stippled and atrophic appearance. The white lines were still present, one running from the optic disc above the macula and outwards to the temporal side of the fundus was near the upper limit of the detachment, and another which followed closely the lower nasal branches of the central retinal vessels was unchanged in its position and relation to these vessels. The retina in the immediate vicinity of the macula was thinner than normal, but there were no gross degenerative changes. The remainder of the retina was healthy.

The retina has remained in place up to the date of writing this paper (September 24, 1934); the visual acuity is 6/24 with +1·5 cyl., ax. 115° and the visual field is full.

Case 2.—Mrs. S., aged 47 years, a patient referred to me through

the kindness of Dr. D. Davies of Tunbridge Wells, had noticed a shadow in the right lower nasal quadrant of her visual field for two months before I saw her on January 15, 1934. Dr. Davies had noted a vitreous haemorrhage which on clearing revealed a retinal detachment at the site shown in Fig. 2.

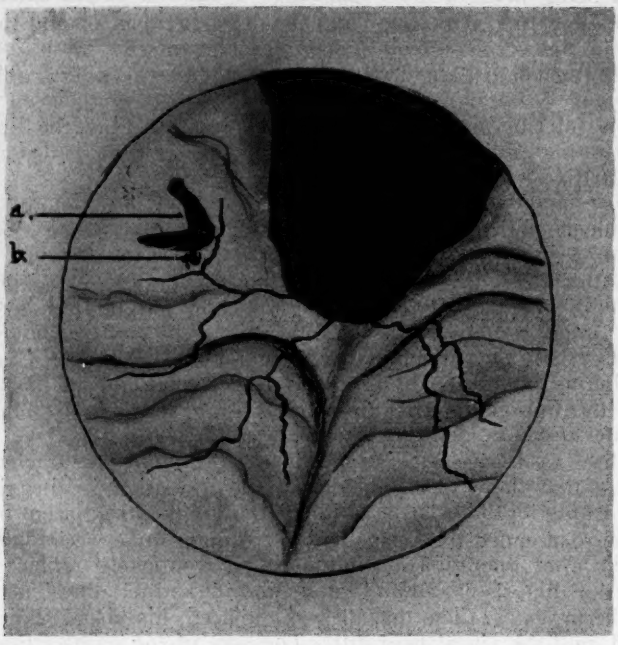

FIG 2

Diagram showing the site of the detached retina in Case 2.

a. Horse-shoe shaped retinal tear.
b. Small haemorrhage in the retina adjacent to the tear.

The macula was stripped off. In the "10 o'clock" meridian and approximately 3 optic disc diameters from the ora serrata was a horse-shoe shaped retinal tear with its concavity facing upwards and outwards. A vessel ran in close proximity to this and there was a small haemorrhage along the lower margin of the tear where a branch of this vessel evidently had been torn across. The right vision was reduced to hand movements.

Fine vitreous opacities and a generalized vitreous haze were present in both eyes. There was no gross evidence of choroiditis in either eye.

The left vision was 6/6 and improved by +0·25 cyl., ax. 10°.

On February 3, 1934, an operation was performed. The sclera was exposed in the upper temporal quadrant of the right eye and surface diathermy applications made over an area from "11 o'clock to 9 o'clock" and in depth 13 to 16 mm. behind the limbus. A 1·5 mm. trephine hole was made at the upper edge of the external rectus muscle about 14 mm. behind the limbus. Inter-retinal fluid was evacuated and the conjunctival wound sutured.

During the post-operative convalescence the retina became replaced in the upper temporal quadrant in the vicinity of the tear where satisfactory choroido-retinal adhesions were formed over the area treated by diathermy. Posterior to the tear the retina remained detached involving the macula and extending downwards affecting the lower half of the retina. The tear in the upper temporal quadrant was apparently closed and no other retinal hole was detected. The intra-ocular pressure was low. The inter-retinal fluid increased, and on the 14th day following operation after some deliberation I decided to make another row of surface diathermy applications posterior to the site of the tear in the upper temporal quadrant and to drain the inter-retinal fluid by making a trephine hole near the equator in the "7 o'clock" meridian, having first surrounded this by a ring of diathermy applications before puncturing the choroid. This was done with some difficulty owing to the low intra-ocular pressure. The result was far from satisfactory. The eye remained very soft and the detachment, if anything, was more extensive. The choroido-retinal adhesions in the upper quadrant held fast and the tear was apparently closed. Two weeks after the second operation the detachment was a little shallower, but still present in the lower half of the globe involving the macula. The patient was allowed up on March 3, and the condition of her eye was the same when she returned for examination on March 9. On April 20 much of the detachment was replaced. Two small areas of very shallow detachment were present, one adjacent to the macula on its temporal side and the other near the ora serrata in the "6 o'clock" meridian. The retinal tear was still closed and good scarring was evident in its vicinity. On May 25 there was no sign of retinal detachment, the visual field was full and the vision 6/24 (one letter) with −1 sph. +1·5 cyl. axis. 150°. Some dot-like lens opacities were noted and the vitreous showed a faint central haze.

On July 23, the right vision had improved to 6/24 (all the letters) with a correcting lens. Good choroido-retinal adhesions were noted in the upper temporal quadrant, the tear was sealed, the retina in place and the visual field full. There was no ophthalmoscopic evidence of gross disturbance at the macula.

Commentary

These two cases have in common the facts that the eyes were almost emmetropic, and that although the immediate result of the surface diathermy was an apparent failure in each case the detached retina and the field of vision were restored ultimately; in case 1, six weeks after operation, and in case 2 about three and a half months later.

The age of the patient, the duration and the site of the retinal detachment and the position of the retinal tear differed in each case. It is interesting to remark in passing that restoration of a retinal detachment of long standing (probably four years) was possible in a boy of 13 years of age whose powers of intelligent co-operation and appreciation of the situation were negligible.

Such explanations as I offer for the somewhat dramatic course of events in these two cases are of a conjectural character. It is probable that for some hours after the evacuation of the inter-retinal fluid through the scleral trephine hole there is an excessive production of aqueous fluid some of which fails to be held in physical combination with the vitreous gel and either drains away through the normal channels or seeps through the retinal tear, which at this stage is not closed by organized fibrous tissue or held down by adjacent choroido-retinal adhesions, and collects in the inter-retinal (sub-retinal) space. In some cases drainage through the scleral trephine hole and choroid puncture may be slow or ineffective after the lapse of some hours owing to the occlusion of this exit channel by inflammatory exudates. (However, it is a fact that leakage of intra-ocular fluid through a scleral trephine hole has been detected at a second operation three weeks after the first.)

The failure of the aqueous to form a stable physical combination with the vitreous gel, either through disease of that structure or through chemical and physical alterations concerned in the maintenance of its hydrostatic equilibrium, causes a diminution of its volume and hypotony, which affects the mechanical support of the retina.

The changes in the choroid after the application of diathermy are inflammatory in nature and it is possible in some cases for an excessive amount of transudate to follow the hyperaemia and increased permeability of the chorio-capillaris. In many cases a shallow layer of fluid is present in the inter-retinal space for a few days after operation and later becomes absorbed when the normal process of choroidal circulation is re-established and the acute inflammatory phenomena are over. This dialysate is rich in colloids and this will upset the osmotic pressure on either side of the detached retina, free aqueous which has failed to form a physical combination with the vitreous gel passing through the retina and increasing the volume of fluid in the inter-retinal space.

In the cases under discussion there was no doubt, at any time, so far as could be judged by ophthalmoscopic examination, that the retinal tears were occluded by exudate. At first this occlusion would be of a cellular and fluid character and so would permit fluid to pass through it. Later, with the formation of fibrous tissue, such fluid filtration would be less free and eventually be cut off by the formation of firm adhesions between the retina and the choroid adjacent to the edges of the retinal tear.

It is probable that something of this nature occurred in these cases, the retinal tear becoming firmly sealed and the inter-retinal fluid gradually undergoing absorption as the hydrostatic equilibrium of the vitreous and the intra-ocular pressure became adjusted or re-established.

THE RESULT OF ORTHOPTIC TREATMENT IN DIVERGENT STRABISMUS

BY

SHEILA MAYOU

LONDON

THE purpose of this article is to consider the effects of orthoptic treatment on a series of cases of divergent strabismus of various types. As will be shown, orthoptic treatment plays an important part in every case, only a small number finally coming to operation. Of those operated on, all with the exception of one, had had previous training, which had developed fusion and some power of adduction before the operation, so that afterwards the desire for binocular vision enhanced and consolidated the success.

Out of 800 consecutive cases I find that 93 are cases of divergent strabismus.* Of these 93 cases, 48 were emmetropic, 26 were hypermetropic, and 17 were myopic. The high percentage of these emmetropic cases occurring in this series is noteworthy, and I hope to show that these patients are the most favourable to treat.

It is well-known that the majority of convergent squints are hypermetropic and are often spontaneously cured by correcting the error of refraction. In my cases of divergent strabismus there is no error to correct, so that the improvement shown must be due to the exercises only, there being no other treatment which may have been responsible for the cure.

*Constant concomitant (monocular or alternating) and occasional or periodic divergences are all included. Simple exophorias without demonstrable divergence are not included.

A further point of interest which is noteworthy, is the very small percentage of cases that are associated with amblyopia, even in the unilateral divergent cases it does not occur frequently.

Age of onset.—Of these 93 cases I have an accurate history as to the age of onset in 58 per cent., and it is interesting to note that of 36 emmetropic cases 17 are supposed to have squinted since birth and a further nine cases within the first year. A high percentage of these cases come under the heading of periodic or occasional squint which I will discuss later. These cases are not considered to be the same as excessive exophorias, though it is possible that the cases beginning in adult life are due to "break-down exophorias." Of the 12 hypermetropic cases four were noticed from birth and the ages of the three that developed after 10 years of age were 14, 21 and 29 years respectively. Of the 10 myopic cases only two were noticed from birth and four developed after the age of 10 years. The respective ages of these four were three of 16 years and one of 35 years.

The following is a table of these 58 cases showing the age of onset:—

AGE	EMMETROPIC	HYPER-METROPIC	MYOPIC
To 1 year... ...	26	4	3
2-4 years	5	4	1
5-10 years ...	5	1	2
Over 10 years ...	0	3	4
	36	12	10

Attendances.—The number of visits necessary to effect a cure varies in every case. In some cases seven lessons have proved sufficient with home exercises, but in others it has taken 50 lessons and homework to obtain a satisfactory result. Where there is no binocular vision present and a patient lives in or near London he generally attends the clinic three times a week until he can manage home exercises, and then twice a week. When he has made good progress and it is seen that the homework is proving beneficial he is then allowed to work at home only and attend the clinic for supervision. This, of course, is only possible when the parent of the child or nurse will take sufficient interest to see that the exercises are carried out every day. Intensive fortnightly or three-weekly courses are arranged in the holidays for children who live in the provinces and home exercises are carried out in the interim.

Methods and instruments.—As far as possible I will endeavour to outline the stages of treatment in connection with the home exercises. All cases as soon as it is possible are given home exercises to practise between their lessons, and the instruments they use are hired from their opticians at a very low rate.

Where the patient has little or no binocular vision it is not possible to have any homework and all exercises are given on the synoptophore or the synoptiscope, as it is possible with these two machines to watch the corneal reflexes. When simultaneous macular perception has been obtained the case is then given a cheiroscope or a strabismuscope to decrease the area of suppression and develop simple fusion by the use of simple toys.

Tracings are given and a more advanced set of toys used to strengthen the fusion. At the clinic the child is taught to fuse on the synoptophore by superimposing two similar objects on top of each other, and fusion exercises are given on the myoscope or myoculator. Having developed the fusion sense it is necessary to increase the power of adduction, if this is very weak a Cruise stereoscope with either plain fusion pictures or stereoscopic pictures is given for homework. When the adduction is 15° or over I have found that a Worth's amblyoscope has proved to be very valuable and has increased the adduction to about 40°. Another small instrument that has proved useful is a small diploscope and the patient is taught to control his eyes by going through the four exercises.

At the clinic the power of adduction is increased by working on convergence exercises on the synoptophore, the variable prism stereoscope and on the myoculator, and special slides have been designed for the synoptophore to develop perception of depth.

Aetiology

A great number of cases have a family history of squint, especially those that come under the heading of periodic or occasional strabismus, but I am afraid that I cannot produce the exact percentages. It is stated in Worth's book on squint that the ideal age to develop binocular vision is between the ages of 3 to 5 years; between the ages of 5 to 6 years it is a lengthy process, and over 6 years of age it is not worth the trouble and time.

The following results, however, tend to show that the optimum age period can be extended a good deal further. The majority of patients who have attended for treatment are usually between the ages of 4 and 12 years, and up till then the results have been uniformly good. I have even a few cases that have developed binocular vision when over 20 years of age. The details of two of these will be discussed under the heading of unilateral strabismus.

Alternating divergent strabismus.—In the cases of alternating divergent strabismus where the angle of deviation is small and there is little or no binocular vision present, the results obtained by orthoptic treatment are good. If, however, the patient has good binocular vision on the synoptophore when first tested, it is much harder to effect a cure. Although there may be binocular vision the

visual axes are not parallel; it seems as if there must be some other element that has upset the equilibrium, or, maybe, there is present an excessive exophoria which has broken down. However, the results of the treatment are obtained only if the patient is sufficiently young, and if after some treatment the binocular vision shows signs of developing. (Needless to say it is necessary to have the co-operation of the child and the parent so that the treatment can be carried out at home.)

Where the angle of deviation exceeds 10° to 15° approximately, I have found that it was not always possible to effect a cure by orthoptics only. In these cases the exercises have proved extremely valuable as a preliminary and the patient has been taught to fuse and adduct a few degrees before the operation was performed; after the operation the treatment has been continued and stereoscopic vision developed.

CASE 1.—*Alternating divergent concomitant strabismus.*

J. P., aged 10 years. Emmetropic. Brother also has divergent strabismus. Angle of deviation on first visit −15°. First grade of binocular vision, but no simultaneous macular perception present. After six lessons the angle of deviation was 8° and the fusion angle 0°*. When I saw her three months after she had worked on fusional drawings and convergence exercises the angle of deviation was −6°, the fusion angle 0°, she had 20° of adduction and some stereoscopic vision. Five months later, during which time the exercises were overlooked, the angle of deviation was −4°, the fusional angle 0°, stereoscopic vision good and power of adduction 30°. The eyes still diverge occasionally on looking into the distance and she is now working on an amblyoscope at home. Period taken, 10 treatments covering eight months.

CASE 2.—*Alternating divergent concomitant strabismus.*

M. R., aged 16 years. First squinted at 4 years of age; was left-handed and was trained to be right-handed. Emmetropic. Angle of deviation on first visit −46° with a left hyperphoria of 6 prism dioptres, and a right incyclophora 3°. She attended the clinic three days a week, after 18 lessons complained of diplopia and after 31 treatments acquired simultaneous macular perception, fusion and her power of adduction was 8°. Angle of deviation being −38° left hyperphoria 4 prism dioptres. She was then admitted into hospital and had the right internal rectus advanced and the right external rectus tenotomized. Eight days after, the degree was 0° with a right hyperphoria of 7 prism dioptres. She attended daily for a fortnight and then less frequently until she was able to manage a stereoscope at home. After 49 treatments, covering a period of five months, she had a good binocular vision, obtained Worth's four lights and was orthophoric on the Maddox rod test.

CASE 3.

P. D., aged 31 years. R. = $\frac{-4.0 \text{ sph.}}{-1.0 \text{ cyl.}}$ L. = $\frac{-4.0 \text{ sph.}}{-1.0 \text{ cyl.}}$ Squinted for 15 years.

Right internal rectus advanced, and 16 days later angle of deviation was −30° to −35° and there was no binocular vision. By working on a strabismuscope at home she has now obtained simultaneous macular perception and some degree of fusion, but the angle of deviation has not decreased, and she does not wish for a further operation.

*The angle of deviation is the actual angle of squint measured on the synoptophore, it differs from the fusion angle in so much as the slides used to determine it have no fusion element. The fusion angle generally tends to be greater than the angle of deviation when the fusion is very weak, but as the fusion strenghthens, the fusion angle decreases and becomes smaller than the angle of deviation.

Unilateral divergent strabismus.—On looking through the cases of unilateral strabismus, I find that they form several groups and are not all benefited by the same treatment.

In order that I may discuss the subject of divergent unilateral strabismus at length I shall grade the cases under the following headings:—

(1) Unilateral divergent strabismus.

(2) Unilateral divergent squint associated with hyperphoria and cyclophoria.

(3) Periodic or occasional divergent strabismus.

(1) In the case of a unilateral divergent strabismus associated with emmetropia where the degree of deviation was not excessive, and there was amblyopia present I found that the results of the exercises were good. The good eye was occluded until the vision was equal, and the patient was taught to alternate whilst the treatment was in progress. The treatment consisted of developing the binocular vision by obtaining normal retinal correspondence and simultaneous macular perception, and I have found that it is not advisable to advance further until this stage has been reached. The patient was then taught to fuse and to appreciate perception of depth and then his power of adduction was developed. In the case of a unilateral divergent strabismus where there was a large deviation present, I found that after having taught the patient to alternate and having developed the binocular vision the degree had only lessened very slightly. It was necessary in this case, to assist the treatment by an operation, but before this was effected the patient had good fusion and some power of adduction.

I have a few cases of divergent squint which are associated with hypermetropia and on testing I found that the binocular vision on the synoptophore was good. This type of case has proved difficult to treat and is often rather lengthy. The patient is able to converge on a finger, but during the treatment is often given to "convergence spasms." What is the reason for this divergence? The visual axes are not straight and yet when tested on the instrument the binocular vision is found to be good. The unilateral divergent strabismus associated with hypermetropia where the binocular vision is not good has not proved difficult to train. Where the child is unable to alternate, the good eye is partially occluded until he is able to alternate at will, and as the binocular vision develops so the divergence decreases.

The cases of unilateral divergent strabismus associated with myopia have, in my opinion, taken longer to cure. In some cases the results were gratifying, but in others the myopia increased,

whether this was progressive myopia or whether it was increased as a result of the treatment, I do not know, but the exercises were suspended.

The following are four cases that have been under treatment:—One emmetrope, one myope, two hypermetropes, one with amblyopia and one with good binocular vision when first tested.

CASE 4.—*Right divergent concomitant strabismus.*

R. V., aged 19 years. Divergence noticed during last four years. Homonymous diplopia, although divergent on tests. Worth's lights, four momentarily, usually alternates. Attempts fusion at −10°, although apparent angle of deviation is −15°. After 13 lessons obtained first grade of binocular vision with angle of deviation −7°, right hyperphoria 3 to 5 prism dioptres. After 31 lessons obtained Worth's lights four. Maddox rod readings were exophoria 1°, wing 01−4, convergence 55°. Stereoscopic vision good.

After 51 lessons over a period of two years and six months, angle of deviation 0°, binocular vision very good, Worth's lights four, rod exophoria 1° to 1.5°, wing test orthophoric.

CASE 5.—*Right divergent concomitant strabismus.* R. and L. +3.50 sph.

A. W., aged 6 years 6 months. Squinted from birth. Vision right eye 6/12 after one year's occlusion; angle of deviation −9°; left hyperphoria 3 prism dioptres; Worth's lights five; no fusion. After 11 lessons over a period of 19 months visual acuity right eye 6/6; angle of deviation −5; left hyperphoria 1 prism dioptre; angle of fusion 0°; adduction 15°—20°; stereoscopic vision partial. Obtains four Worth's lights. Eyes nearly always straight. He is working on an amblyoscope to increase adduction.

CASE 6.—*Left divergent concomitant strabismus.*

P. P., aged 8 years. Age of onset seven years. Hypermetropic in both eyes $\frac{+1.0 \text{ sph.}}{+0.25 \text{ cyl.}}$ Angle of deviation on first visit −7°; fusion −5°; adduction 5°. Partial stereopsis. Good convergence on one finger.

After 12 lessons, angle of deviation −5°; fusion angle 0°; adduction 5°; stereoscopic vision better. Given drawings at home. After 27 lessons, angle of deviation −5°; angle of fusion 0°; adduction 30°; stereoscopic vision good.

Eyes very variable. Left eye still diverges occasionally.

CASE 7.—*Left divergent concomitant strabismus.*

C. K., aged 9 years 6 months. First noticed occasionally at the age of nine months, re-appeared at three years as a constant squint.

R. = −0.75 sph. L. = −0.12 sph.

Angle of deviation −17°. Right hyperphoria 4 prism dioptres, increasing to 6 prism dioptres looking to the right. Alternates on Worth's lights. Her binocular vision was good, but adductions very weak and stereoscopic vision only partially developed. Convergence on the finger good.

This child's treatment has been worked by a series of intensive courses of a fortnight with homework in the interim. At the end of her first fortnight's treatment the angle of deviation was 0°, and adductions 30°. She was given a Cruise stereoscope with Sattler's pictures to use at home.

When she was seen three months later for a test and nine months after this for a second course of treatment, the angle of deviation was −5°. After 40 treatments C. K. can control her eyes well, she squints occasionally; is orthophoric on the Maddox rod test and maintains Worth's four lights, both with and without glasses.

I have no cases of unilateral divergent strabismus that have been operated on.

CASE 8.—*Right divergent concomitant strabismus.*

P. C., aged 9 years. Age of onset six years. R. = $\frac{-3.0 \text{ sph.}}{-1.5 \text{ cyl.}}$ L. = $\frac{-1.5 \text{ sph.}}{-1.0 \text{ cyl.}}$

Glasses given at 7 years of age. Angle of deviation on first visit −10° with a left hyperphoria of 2 prism dioptres. First grade of binocular vision.

After 14 treatments over a period of six weeks, it was found that the myopia in the right eye had increased. The treatment was discontinued with the exception of home exercises, however, these were also stopped owing to further progress of the myopia. This child has fusion and power of adduction is 4°. She is being kept under observation and probably will be operated on later.

(2) In the cases of a divergent squint associated with hyperphoria the treatment has proved very effective. Having obtained the first grade of binocular vision, the fusion sense and stereoscopic vision are then developed. When this stage is achieved the supra- and infra-adductions are trained and convergence is increased to 40° or 50°.

CASE 9.—*Right divergent concomitant strabismus.*

N. C., aged 13 years 6 months. Was ordered +1.25 sph. when a left concomitant strabismus, and became a left divergent concomitant strabismus, so glasses were discontinued.

Angle of deviation when first seen −10° with a right hyperphoria of 9 prism dioptres, and a right in-cyclophoria 5°. She had first grade binocular vision but no fusion. On the Maddox rod test the exophoria was 10°, and the hyperphoria 18°, on the Maddox wing test the exophoria was 22° and the hyperphoria 8°.

She attended daily for treatment for a fortnight and then three days a week. After 24 treatments the angle of deviation was 0° with a hyperphoria of 3 prism dioptres, the readings on the Maddox rod were exophoria 7° to 8°; hyperphoria 5°; and on the wing test exophoria 2° and hyperphoria 2°.

After 30 lessons covering a period of three months she was discharged with good binocular vision. Readings on the wing test orthophoric and on the rod test hyperphoria 0.5 prism dioptre and exophoria 1°.

When seen during the next year she was orthophoric in both rod and wing tests.

A similar case to the above is one where the divergence is associated with cyclophoria instead of hyperphoria.

These cases of divergent strabismus wih hyperphoria or cyclophoria are very interesting and react extremely well to treatment if there is some defect in the binocular vision. As the binocular vision develops and the fusion is strengthened the hyperphoria and cyclophoria gradually decrease until the patient can fuse at 0° (on the synoptophore). When this is obtained and he is able to adduct a few degrees, and has acquired some stereoscopic vision it will be found that the hyperphoria or cyclophoria will have disappeared. Occasionally, when the hyperphoria has not disappeared it has been found necessary to train the supra- and infra-ductions.

CASE 10.—*Right divergent concomitant strabismus.* R. = +2.0. L. = +0.25. (For reading only.)

C. D., aged 29 years. First squinted between the age of two and three years; attributed cause, whooping cough. Angle of deviation on first visit −18° right hyperphoria 7 prism dioptres (variable) and right in-cyclophoria 15°, no fusion. After 13 lessons angle of deviation 4°, obtained fusion at 0° with a right hyperphoria of 2 prism dioptres; adductions 5°. After 23 lessons angle of deviation 0°; angle of fusion 0°; adduction 25°; stereoscopic vision fairly good.

C. D. still allows the right eye to wander when tired, but is continuing to use her amblyoscope and is satisfied with her result.
Treatments, 23 over a period of nine and a half months.

(3) The high percentage of these occasional or periodic squints found in young children is interesting. The history of very case is very similar.

1. Usually there is no refractive error.
2. A history of one wandering since birth or within the first year.
3. Hereditary history.
4. These cases are rarely associated with amblyopia.

Of the 93 cases of divergent strabismus which I have seen, 22 were of this type. Of these 22 cases, 17 were emmetropic. Of these 17 cases, 13 were noted from birth or within the first year. Of these 13 cases, seven have a family history of strabismus.

In these cases the eyes appear to be straight, except on covering, or when the child is tired or looking into the distance. On examination of these cases I have found that there is usually 15° to 25° of divergence and little or no binocular vision present. They respond well to orthoptic treatment, but the results are not quickly or easily obtained.

There is little difficulty in achieving normal retinal correspondence, but the development of the fusion sense has been unusually slow. The cases have been taught to fuse on the synoptophore, by using two similar pictures with small control marks on each, which they superimpose. They practise at home on the cheiroscope and strabismuscope with toys and tracings. This stage accomplished, they are taught to appreciate perception of depth and then their adduction or fusional convergence is increased to about 40° or 50°.

CASE 11.—*Left divergent concomitant strabismus.*

J. W., aged 7 years 6 months. Squinted since birth. (Grandmother has a squint, emmetropic.) Angle of deviation −15°, alternates on Worth's lights. Weak fusion. Given a cheiroscope with toys and drawings for home use, and a Cruise stereoscope. Seven months later angle of deviation −5°; fusion angle 0°; adductions 20°. Partial stereoscopic vision. Has now an amblyoscope at home, angle of deviation 0°; fusion angle 0°; adduction 30°. Stereoscopic vision good. Worth's lights four. Treatments, 13. Period, one year.

CASE 12.—*Left divergent concomitant strabismus.*

G. H., aged 7 years. Squinted since birth. Eyes appeared straighter after three weeks, but squint reasserted about 4 years of age. Emmetropic. Angle of deviation −20°, left hyperphoria 4 prism dioptres. No fusion. Attended the clinic three times a week for nearly three months. Angle of deviation −20°; fusion angle −20°; adduction 10°. Given fusional drawings at home and although the degree of deviation is still −15°, the fusion angle is 0°. The power of adduction is 15°,

and stereoscopic vision is partially developed. The left eye was seen to wander occasionally. She is, however, continuing to use the amblyoscope to increase the power of adduction to 40°.

CASE 13.—*Left divergent concomitant strabismus.*

O. P., aged 25 years. Squinted since 8 years of age. "Due to a bad fall." Emmetropic. Angle of deviation on first treatment −13° with a right hyperphoria of 4.5 prism dioptres. Maddox rod test, exophoria 20°. She was unable to fuse or put the lion in the cage (simultaneous macular perception) on her first visit, due to a large area of suppression. At her fourth lesson she was given an amblyoscope. She returned intermittently for treatment, and after four and a half months, having attended the clinic eight times she had simultaneous macular perception, fusion, stereoscopic vision and 30° of adduction. The readings on the Maddox rod and wing test were orthophoric.

A similar type of case to the above, which is not often seen, is one in which the eye diverges only on covering, but otherwise appears to be straight. When this patient with a divergence of 10° to 15°, obtained the first grade of binocular vision, he over accommodated and the degree of deviation instead of being negative angle was positive. These patients are taught to relax their accommodation and the convergence decreases, but no effort is made to train their powers of adduction until stereoscopic vision is well developed. Of the few cases I have seen of this type, all have been emmetropic with the exception of one which was myopic.

CASE 14.

P. H., aged 12 years 6 months. Age of onset 5 to 6 years. Alternates on Worth's lights. Angle of deviation −15°; right hyperphoria 7 prism dioptres fixing right eye. Angle of deviation −15° no hyperphoria fixing left eye. Objective reading −15°; subjective −10°. Therefore, abnormal retinal correspondence. After seven lessons obtained normal right correspondence at 0°. Whilst endeavouring to obtain simultaneous macular perception the angle of the deviation increased to +20°., *i.e.*, 20° of convergence and he was unable to see clearly when the lion was in the cage. After 13 lessons the angle of deviation was +20°; fusion +15°; no stereoscopic vision.

He went away for the holidays, taking a strabismuscope on which he practised fusion drawings. He found these extremely difficult as he was unable to keep the outline clear. However, he continued treatment at home on a synoptophore, and when I saw him two months later he had stereoscopic vision, but he also had 15° of convergence on the rod and wing tests and yet the eyes were still diverging.

He has been attending twice a week for the first half of his school term and then once a week. He is now at 0° on the synoptophore; has 40° adductions; 10° of adduction; good stereoscopic vision. On the Maddox rod the readings are orthophoric, and on the wing test 01—2 at the beginning and end of the lesson, but he still complains of diplopia when looking at aeroplanes! He is now working on the myoculator on up and down movements, and a small diploscope.

Treatments, 33. Period, eight months.

One of the most difficult cases to cure is the divergent squint due to an operation, or a convergent strabismus where the internal rectus has been too freely tenotomized. In some cases where the eyes are only slightly divergent, by strengthening the binocular vision it is possible to straighten the eyes. However, in others

where there is no binocular vision present or when the fusion is weak, the eye becomes slightly proptosed and slowly more and more divergent. In these cases it has been necessary to re-attach the internal rectus.

Summary

From the point of view of treatment, cases may be considered under the following headings:—

(1) *Divergent strabismus curable by orthoptic treatment only.*
- (*a*) Alternating strabismus with small angle.
- (*b*) Unilateral strabismus with small angle.
- (*c*) Divergent strabismus associated with hyperphoria and cyclophoria.
- (*d*) Periodic or occasional divergent strabismus.

(2) *Divergent strabismus curable only by operation together with orthoptic treatment.*
- (*a*) Alternating divergent strabismus with an angle larger than 10° to 15° approximately.
- (*b*) Unilateral divergent strabismus with a large angle.
- (*c*) Post-operative divergence.

The conclusions which I wish to emphasize are:—

(1) Cases of divergent strabismus benefit from orthoptic treatment whether they can be cured by treatment alone or whether they will need an operation.

(2) The majority of cases seen are cured by orthoptic treatment alone without operation.

(3) The percentage of emmetropic cases is very high and the majority of them come under the heading of periodic or occasional divergent strabismus.

(4) There are very few divergent squints associated with amblyopia.

A NOTE ON THE FIXATION OF SPECIMENS FOR CELLOIDIN SECTIONING

BY

W. A. GRAY

LONDON

FIXATION of the eye, without deformation of its component parts, is not easily obtained. This is due to the denseness of the outer coats and the loose attachment of the retina to the choroid. In addition, the contents of the eyeball are chiefly fluid.

There are two points of importance, first the fixative used and secondly the time of opening the eye. The usual procedure is to fix the eye for 24 hours in Zenker's solution or in saline containing five per cent. of formalin. To facilitate absorption of the fixing fluid the specimen is punctured with a needle. The eye is then frozen and opened with a median sagittal section. When the above method was employed detachment of the retina frequently resulted. Prolonged immersion (six weeks) in Müller's fluid gave no better results.

Despite the unfavourable opinion expressed by Heesch and others of alcohol as a fixative, this method gave the best sections. The vitreous was obtained almost complete, except for some shrinkage, between the ciliary body and the optic disc, away from the retina. Detachment of the retina was uncommon. It is essential that not more than 30 per cent. alcohol in distilled water should be used at first, and the strength of the alcohol is gradually increased by two per cent. up to absolute alcohol. The specimen is opened after the first 24 hours in absolute alcohol, when a small portion at the corneo-sclerotic junction is sliced off.

The complete method consists of the following:—

Stage 1.—Fixation for 24 hours in 30 per cent. alcohol in distilled water.

Stage 2.—Fixation in an alcohol series in which the percentage of alcohol is increased daily by 2 per cent. up to absolute.

Stage 3.—Opening of eyeball at corneo-sclerotic junction and further treatment in absolute alcohol for 24 hours.

Stage 4.—Embedding in celloidin in the usual fashion.

Three years' experience of this method has given me consistently good results.

DOUBLE CONGESTIVE GLAUCOMA AND THE RESPONSE TO DIATHERMY

BY

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I AM privileged by the courtesy of Mr. Walbank to submit the details of this case, which may interest others computing the value of diathermy as an ancillary form of treatment in the reduction of increased intra-ocular tension. It is of unusual interest in that, in the same individual, one eye was used as a control against the other, both being in a state of hypertension as the result of similar pathological sequences.

Since I was in charge of the Wards as well as of the Diathermy Department, I had the opportunity of controlling treatments from the time of admission. In this case no previous treatment had been given.

The apparatus employed was the Moorfields pattern made by Messrs. Weiss, the active electrode being of lead as adopted by Mr. F. W. Law.[1]

I use three layers of gamgee, wrung out in normal saline, in the form of pads between the active electrode and the lids.

The milliampère-meter readings mentioned are the mean, the output being slowly increased during the first minute up to about 500 to 600 m.a. and then reduced at the patient's direction, as the conductivity increases with the accumulating thermal response.

Tonometry was carried out with a Schiötz instrument with a concave piston end.

S. C., aged 63 years, a packing case maker, of poor physique, and of toxic appearance, gave the history during the last six or seven months of recurrent mild attacks of pain above both eyes, but more so in the right, accompanied by dimness of vision and lasting two to three days with apparent recovery during the intervals.

Vision had diminished during the previous week so that on Monday he was unable to go to work, while on Tuesday he developed severe pain in both eyes. On Wednesday morning following a bout of vomiting he was admitted to hospital complaining of pain and dimness in both eyes. Leeches were applied to the right temple and a purge given.

A central leucoma of the right cornea, lens opacity and oedema of the epithelium in both eyes rendered media examination impossible. The anterior chambers were shallow. The visual acuity recorded may or may not be relative. No corrections were worn.

The following table shows the sequence of events:—

RIGHT EYE				TIME	LEFT EYE			
Treatment	Vision	Schiötz	Pupil		Treatment	Vision	Schiötz	Pupil
Eserine 1% half-hourly. Heat	H.M.'s.	mm.Hg. =63	¾ oval	26/9/34 Noon	Diathermy, 5 mins. 400 M.A. One instillation of eserine 1%	3/60	mm.Hg. =115	½ oval
Continued		=72	Same	5.30 p.m.			=15	¼ round
		=83	Same	9 p.m.	One instillation of eserine		=15	Same
Diathermy. 5 mins. 450 M.A. Eserine 1% repeated four hourly. Heat continued				9.15 p.m.				
Heat discontinued. Eserine continued four hourly		=30	¼ round	27/9/34 10 a.m.	Eserine 1% four hourly		=26	Same
	1/60	=24	Same	28/9/34 6 p.m.		5/60	=14	Same
	6/36	=27	Same	30/9/34 Noon		6/24	=18	Same

On September 30, the result enabled further ophthalmoscopic examination to be made, showing the left vitreous to be clear, and cupping of the disc. Sufficient detail was seen of the right media to exclude intra-ocular haemorrhage.

The blood pressures were 120/90. The fields were slightly concentrically contracted.

Here the interest, from the pre-operative preparation point of view, ends.

REFERENCE

Law, F. W.—*Trans. Ophthal. Soc. U.K.*, Vol. LIII, p. 474, 1933.

ABSTRACTS

I.—ACCOMMODATION

(1) Yeld, R. A. (Edgewood, B.C.).—A thesis on accommodation in the human eye.

(1) In this thesis Yeld has collected a great deal of information concerning the accommodation of the eye and has considered one by one the various hypotheses that have been put forward to explain the various phenomena.

In the introduction he discusses the anatomical details of the parts of the eye involved, quoting freely from the works already published. He then passes to a résumé of the work of Gullstrand on the lens in accommodation, work chiefly aimed at explaining the discovery of Young that the amplitude of accommodation at the periphery of the lens was not the same as that at the centre of the lens. In Part III the changes that take place in the lens are described and discussed, together with the views of Tscherning, Helmholtz, Fincham, Duane, Luedde and Gullstrand.

There is one hypothesis: The hydraulic—that receives a good deal of attention and seems to be the one that is favoured by the author, although he admits difficulties. This hypothesis was brought to the notice of English readers by Lindsay Johnson in 1924. It, however, cannot explain the parabolic form of the lens upon accommodation, which was first seen by Tscherning and caused him to formulate his hypothesis that during accommodation the zonule was tightened.

Helmholtz' original explanation held until Tscherning made his discovery in 1894. Almost every observation that has been made since that date has tended to prove that the zonule was relaxed during accommodation, the observation by Hess in 1910 that the amplitude varied with the position of the head, increased when bent forward and decreased when lying on the back, proved conclusively that the lens moved forward or backwards as the case might be. There were also other entoptic observations of his that proved the loosening of the lens during accommodation. Nevertheless, the parabolic deformation of the anterior lens surface still remained unexplained, and the key of this was given in 1925 by Fincham, all of whose subsequent work has shown that the elasticity of the capsule and its varying thickness, together with the proof of the lack of elasticity of the lens substance, explain all the phenomena that take place in the lens during accommodation.

The author finds difficulty in following the Helmholtz hypothesis; in that, assuming the zonule to be relaxed and that the capsule be relaxed with it, and that the capsule behaves as Fincham has shown, why should the lens substance follow the capsule?

But given a firm support from the vitreous behind (as Fincham has shown) there seems no difficulty in understanding the moulding of the lens by the capsule, and it is not easy to accept the suggestion that suction is produced by a potential vacuum between the relaxed capsule and lens substance.

The author's paper remains as a valuable résumé of the various views that have been expounded and with its extensive bibliography will be an excellent work of reference.

CHARLES GOULDEN.

(2) **Fincham, E. F. (London).—The function of the lens capsule in the accommodation of the eye.** Reprinted from the Transactions of the Optical Society, Vol. XXX, No. 3, 1928-29.

(2) In 1924 **Fincham** published a paper on "The Changes in the Form of the Crystalline Lens in Accommodation" (Transactions of the Optical Society, 1925), which was amplified in a communication to the Optical Convention in 1926. He has followed up these investigations amplifying his views by further observations.

It will be remembered that he suggested that the change in form of the lens during accommodation was caused by the pressure of the elastic capsule moulding the lens substance, and he offered an explanation of the parabolic form of the anterior surface of the accommodated lens by the unequal pressure of the lens capsule which he showed varied in thickness in different parts. This varying thickness was noted by Salzmann, but its significance had not been appreciated before.

By the Helmholtz hypothesis it is suggested that accommodation is produced by the elastic lens becoming more globular when the pressure exerted by the lens capsule is removed by the contracting of the ciliary muscle. This means that if the lens were removed from its capsule it would become more globular than before.

This has been investigated in this research by means of photography, the result being that in the higher primates who show a variation in the thickness of the capsule, the anterior surface of the lens is parabolic when the lens is freed from its attachments, but this parabolic deformation disappears when the capsule is removed.

The conclusions reached are:—

1. The lens surface increases in curvature and assumes the accommodated form when released from its suspensions.

2. The conoidal form of the lens surface is found only in those cases where the anterior capsule has a relatively thin central area surrounded by a zone of greater thickness.

3. The primate lens loses its characteristic accommodated form when the capsule is removed.

4. The amplitude of accommodation is small in those animals which have an anterior lens capsule of uniform thickness.

It is to be expected that the conoidal form of surface has one advantage over the spherical form, and from measurements made in the young living lens, it has been shown that this surface suffers a large change in radius of curvature—moves forward from 0·25 to 0·5 mm. when the peripheral parts of the lens remain stationary. Presumably while producing a great change in the form of that part of the lens which is exposed by the contracted pupil, a minimum movement of lens substance results with economy in ciliary muscle exertion.

The conclusion reached, therefore, is: the lens removed from its capsule appears to be in the unaccommodated state; we may infer that when the eye is not accommodated the compressing force of the capsule is weakened or held off by the tension of the zonule. The process of accommodation consists of the contraction of the ciliary muscle releasing tension upon the zonule, which, in turn, releases the capsule and allows it to mould the lens into the accommodated form.

Gradual sclerosis of the lens in increasing age will reduce the amplitude of accommodation; until in old age the hard lens is not moulded at all and all accommodation is lost.

This causes a necessary modification of the Helmholtz hypothesis which assumes the unaccommodated lens to be held in a compressed and flattened condition, while in accommodation it takes up its free and natural form.

CHARLES GOULDEN.

(3) **Fincham, E. F. (London).—The mechanism of accommodation and the recession of the near point.** Report of a Joint Discussion on Vision, held on June 3, 1932, at the Imperial College of Science by The Physical and Optical Societies, p. 294.

(3) In this paper **Fincham** tackles the phenomenon of the recession of the near point with advancing age.

He first examines the clinical aspect of presbyopia. It is pointed out that whatever be the age of the subject, the full amplitude of accommodation cannot be maintained for long periods with comfort. Considerable effort is needed to accommodate for the near point at any age; that it is possible that the necessary effort

in presbyopia with two dioptres of accommodation is just as great as in the case of a child with 16 dioptres; at all ages the increased innervation accompanying convergence increases the physical accommodation by an appreciable amount above the monocular maximum. It is commonly assumed that the physiological amplitude of accommodation remains unimpaired throughout life, while the lens substance, due to sclerosis, loses its ability to change to the accommodated form. Thus a change in refraction of one dioptre calls for the same amount of ciliary contraction in young and old. This unit, the myodioptre, has a constant value. Thus a presbyope with two dioptres of accommodation uses only a small part of this total ciliary muscle power in reaching his near point, while the young person makes use of a greater proportion of total ciliary power.

This conception is the natural outcome of the Helmholtz hypothesis. But this does not explain the clinical manifestations of presbyopia. If the presbyope reaches his near point by the exertion of only a small part of his total ciliary power, he should do so with ease and should experience no strain in maintaining the effort. This is not the case. The effort needed by the presbyope appears to be as great as that of the young person, and the strain of prolonging full accommodation is of the same order in each case.

Further evidence is found when examining the paralytic effect of homatropine on the physical accommodation; the effect of the drug becoming apparent at approximately equal times at all ages (Duane). Therefore, for an adequate explanation of the clinical symptoms of presbyopia, these modifications of opinions are necessary:—(*a*) That accommodation is not brought about by a greater freedom allowing the elastic lens substance to assume increased convexity (Helmholtz), but that an active deformation is imposed upon it by a force external to the lens substance; or else (*b*) assuming the truth of the Helmholtz hypothesis, that the loss of accommodative power in age is due to loss of ciliary power rather than sclerosis of the lens.

If (*a*) be true, the external force originating in the muscle would need to be greater to impose a given deformation upon the sclerosed lens; if (*b*), then the muscle, being weaker, would need a greater innervation to cause a given contraction, and hence relaxation of tension upon the lens, allowing it to assume a given increase in convexity.

In the previous paper Helmholtz' hypothesis and Fincham's own explanation of the mechanism of accommodation have been explained. (There follows in this paper a beautifully planned and accomplished experiment to prove the elasticity of the zonule, for which the original should be consulted.)

The author then reasons as follows:—The zonule forms an elastic coupling between the ciliary body and the lens capsule. The zonule is kept stretched by the pressure of the vitreous when the ciliary muscle is relaxed. The pull of the zonule is transmitted to the capsule at the equatorial region and this prevents the capsule from distorting the lens substance from its normal unaccommodated form. A relaxation of the pull of the zonule by ciliary contraction allows the capsule to mould the lens substance into accommodation. If soft, the lens matter will yield, if sclerosed, the response will be slight. The tension of the stretched zonule will need to be more reduced to produce a unit change in the form of the hard lens than the soft. As this alteration is caused by a contraction of the ciliary muscle, the muscle must contract more for a unit increase of accommodation in presbyopia than in the young lens.

If the response of the lens substance to the force of the capsule is constant throughout the amplitude of accommodation, the muscle force needed for any given increase in physical accommodation will be proportional to the hardness of the lens substance, and the full physical amplitude will be inversely proportional to that factor, provided that the elasticity of the zonule and capsule remain unchanged.

The author has designed a model that supports these contentions. This paper, therefore, is a complement to his other communications, and they seem to have carried the author's contentions to a happy and logical conclusion. If all the papers are read in sequence, in spite of some repetition, it will be concluded that the views expressed are correct, and the author is to be much congratulated. He is still pursuing his research upon other problems in accommodation.

CHARLES GOULDEN.

II.—MISCELLANEOUS

(1) **Ramsay, A. Maitland. (St. Andrew's).—William Mackenzie, M.D., Founder of the Glasgow Eye Infirmary, and the first Lecturer on Diseases of the Eye in the University of Glasgow.** *Glas. Med. Jl.*, September, 1934.

(1) Although this article appears to have been written for the education of the younger generation (since it appears in the Educational Number of the *Glas. Med. Jl.*) it nevertheless will repay perusal by all who are in the middle of the stream of ophthalmological advance. It sketches in outline the history of

our specialty from the earlies days to the times of Daviel and Beer. From Beer to Mackenzie is but a short step, for Mackenzie returned to Glasgow in the year 1819 after studying in Vienna. The first edition of his book—A Practical Treatise on Diseases of the Eye—was first published in 1830 and, as our author says, "His descriptions of diseased conditions are, therefore, as true to-day as when they were written, and in the majority of instances the colours are as vivid as when the picture was painted." (Of course this can only be true of that which was known, and at the time of the first edition the ophthalmoscope was not invented. It was, in fact, invented in 1851. Mackenzie's fourth and last edition was published in 1854, and though he mentions the ophthalmoscope of Helmholtz in two places in his book he does so without enthusiasm. It had come too late in the life of Mackenzie. E. T.).

Ramsay points out that though the ophthalmoscope is hardly mentioned in his 1854 edition, his note books show that "He was always anxious to learn so he persevered in his efforts to acquire facility in the use of the new instrument, and notes from his private case-books prove that he had made many ophthalmoscopic examinations." Finally, two quotations from this interesting little article may be allowed; they are not contiguous.

"The temptation to speculate on what Mackenzie would say if he were to reappear among us to-day is irresistible. I feel sure he would be pleased, but how great would be his amazement. He could not fail to contrast the spacious wards, the aseptic operating theatre, and the well-equipped research laboratories of the present day, with the old Charlotte Street Eye Infirmary of his own time, which he then thought was so adequate. Doubtless he would make many pawky comments and wise criticisms all leading up to the warning that the reputation of a Medical School does not depend upon stone and lime, but upon the character and the ability of its students and teachers." And this one: "He had in a high degree sturdy common sense and clear insight—qualities which are often lacking in the up-to-date specialist. He saw far and he saw deep. He was an observer rather than an experimenter, but by the lasting quality of his work he has demonstrated that the clinician at the bedside is in no way inferior to the research worker in the laboratory."

ERNEST THOMSON.

(4) **Wilmer and Paton (Baltimore).—Pantocain as a local anaesthetic in ophthalmology.** *Amer. Jl. of Ophthal.*, February, 1933.

(4) **Wilmer and Paton** report the effect of pantocain, a derivation of novocain, on 10 normal eyes and as a local anaesthetic in a number of eye operations, both major and minor in character.

According to certain observers the toxicity of pantocain is 10 times that of novocain when injected subcutaneously into experimental animals, but as the effective dose of pantocain is one-tenth that of novocain their relative toxicity is 1 : 1. Pantocain is inexpensive, has a prolonged action, in some instances lasting as long as 4 to 6 hours, is readily sterilized and combines well with adrenalin. It causes no irritation or hyperaemia when instilled into the conjunctival sac. In some cases there was a slight degree of smarting which lasted no longer than 25 to 47 seconds. Anaesthesia is complete in two minutes. Two drops of a 0·5 per cent. solution are sufficient for the purpose of tonometry, dilatation of the puncta and other minor procedures. There is very little tendency to drying of the cornea, the pupil does not dilate and the intra-ocular pressure is not increased.

H. B. STALLARD.

BOOK NOTICES

Optics. By W. H. A. FINCHAM. Hatton Press. 1934. Price, 15s.

This is a text-book written primarily for students attending a department of applied optics and is intended to cover work required by a student up to the stage at which he commences to specialize in such subjects as ophthalmic optics, optical instruments and lens design. It also includes the work required by students of Light for the Intermediate Examination of the Universities.

The book is well produced and as well as the lucidity of the diagrams, contains some beautiful photographs illustrating Interference, Fringes, Newton's Rings, Diffraction, and so on, the best we have ever seen (Mr. Fincham is a well-known and skilful photographer whose studies are frequently seen at photographic exhibitions).

Outstanding features of the book are lucid exposition, such as we would expect from an experienced teacher, and a well selected collection of exercises. We do not know of any other text-book in English which combines so conveniently the theoretical exposition of optical apparatus as well as diagrammatic illustrations that give at a glance the explanation of say, erecting prisms, telescopes, and the rest.

It is altogether an attractive volume of moderate price, to which one may turn for an exposition of any problem that may arise in the work of an ophthalmic surgeon.

Le Decollement de la Retine. Pathogenie-Traitement. By J. GONIN. Pp. 279, text figures, 77, plates, 38. Lausanne: Libraire Payot et Cie. Price, 50 Swiss francs.

This monograph, by the acknowledged pioneer in what has been one of the greatest advances in ophthalmic surgery in recent years, should be read by every ophthalmologist. In spite of the fact that any bibliography of the subject of detachment of the retina shows the production of between 300 and 400 papers within the last 25 years, this book should be enthusiastically welcomed. It bears throughout the stamp of an intense individuality and is in no sense a review or compilation. It is a logical, reasoned treatise, showing the steps by which the author arrived at his conclusions concerning the pathogenesis of detachment. His scientific work on the subject led him by direct inference to the method of treatment which has since proved so successful. It is true that Galezowski in 1902 had cured a detachment by means of ignipuncture in the region of the tear, but his conceptions of the development of the tear were unconvincing. The operation was, therefore, thought to be purely empiric, and was never seriously considered. It remained for Gonin, working primarily to prove or disprove Leber's work on the pathology of detachment, to point the way to a rational treatment.

The monograph is divided into two sections, the first on the Pathogenesis of Detachment, and the second on Treatment. The pathology is dealt with from every point of view. Both traumatic and non-traumatic detachments are considered and the mechanism of the various groups illustrated by actual examples. The author has amassed a most convincing collection of both macroscopic and microscopic preparations (which the reviewer has had the opportunity of inspecting and studying) and this part of the book is freely illustrated by actual cases.

Reference is made to the work of other observers and Arruga's *Rapport* presented at the 1933 Congress in Madrid is considered. The author is insistent on the importance of a thorough examination of specimens if a proper idea of the pathological relations of the vitreous, the detachment and the retinal hole is to be arrived at. He emphasizes, what is now probably admitted by most observers, the extreme frequency of the retinal hole, tear or disinsertion. He insists that clinically failure to find the hole (in the absence of corneal or lens opacities) in more than 2 per cent. of recent detachments is due either to an insufficient search or to lack of experience in recognizing the hole when seen, since it can assume a multitude of appearances. He points out certain conditions which constitute a prodromal stage, such as minute foci of peripheral choroiditis, irregularities of pigmentation,

migration of pigment cells from the ciliary region into the vitreous and posterior detachment of the vitreous.

The second part of the book deals with treatment. As a logical result of the pathology demonstrated in the first part the treatment is seen to consist in sealing the retinal hole or holes. The author holds no particular brief for his own method (puncture with a Paquelin cautery), but attempts to assess the value of all the known methods (ignipuncture, chemical cauterization, and electrocoagulation) in the various types of case. He believes that indications for one operation rather than another can sometimes be found in the size, number and situation of the holes and in the state of the vitreous and retina. He shows, however, that, properly applied, practically all the methods can produce successes. Particularly interesting is a series of cases, almost identical in type, but all cured by different methods. He emphasizes throughout the fact that the essence of success is an extremely careful clinical examination.

The book is well printed and bound. It contains a large number of coloured plates of great beauty, mostly the work of the author himself. The whole bears the stamp of originality and sincerity.

Biomicroscopie de la Conjonctive. By A. CUENOD ET ROGER NATAF. Paris: Masson et Cie. Price, 150 francs.

This volume completes the system of slit-lamp microscopy of the living eye that has been planned and published by the Société Française d'Ophtalmologie. These publications have varied in excellence, although all have been good.

The conjunctiva does not lend itself to slit-lamp examination so well as other anterior parts of the eye, but Drs. Cuenod and Nataf have produced a volume full of interest and most beautifully illustrated, the artist being M. Iseli, who presumably was responsible for the pioneer drawings in the first edition of Vogt's Atlas.

Some of the early part of this volume consists of an elaborate discussion of the anatomy and histology of the conjunctiva, and is consequently not really slit-lamp microscopy at all, but the authors have inserted it so as to correlate their own findings with the published accounts of earlier observers, especially that of Bailliart on the circulation of the conjunctiva in health and disease.

First, then, there is a description of the normal conjunctiva with special attention to the vascularization of the limbus. A section deals with the lymphatics, on which in the past there have been such discordant opinions.

Researches have been conducted by means of vital staining. The authors have used dyes, methylene blue, polychromatic

methylene blue, as well as other stains. By this means they are able to stain the epithelium, sometimes isolated cells, sometimes in groups.

They admit that it is difficult to stain a living cell, and believe that the cells that take up the stain, although possibly living, have reached the term of their existence and are on the point of desquamating.

With methylene blue, after a preliminary use of cocaine, certain star-shaped cells of the conjunctiva itself may be stained, sometimes above and sometimes below the level of the superficial vessels.

Nerves may be stained, preferably by a subconjunctival injection of methylene blue. By this means the corpuscles of Krause may be seen. The nerve fibres are best seen by the use of polychromatic methylene blue.

Observations by this method have been made on the vessel walls and lymphatics.

When we come to the section dealing with pathological conditions there is a detailed exposition of the various stages of trachoma, which is most informative and illuminating, and should be of help in the diagnosis in the early stages of the disease.

The authors' practice in North Africa where they have a large experience in trachoma, and their description of the earliest stages of the disease seen in children, before any complication by new or old conjunctivitis, is of great value. We have seldom met with such a careful description of any of the stages of trachoma.

In dealing with follicular conjunctivitis, sub-divisions are made; pseudo-follicular, chronic follicular, swimming-bath follicular conjunctivitis (on which Morax has published such an excellent monograph), acute follicular conjunctivitis (Beal), and lymphoid hypertrophy with opalescent nodules (Dejean and Temple).

In all these forms the authors point out small differences in slit-lamp appearance.

Spring catarrh does not seem to present any new appearance nor phlyctenular conjunctivitis.

Scleritis or episcleritis, and Parinaud's conjunctivitis seem to offer no new signs and the same applies to tuberculosis, syphilis, pemphigus.

In lesions produced by the gases of warfare, note is made of the varicosities of the vessels which were first described by Genet.

An interesting observation concerns certain signs of gassing:— (*a*) Abnormal vascularization at the limbus, the vessels being abnormally red, dilated, and tortuous; (*b*) the scleral portion of the limbus appears more opaque and extensive than usual; (*c*) anaesthesia, or lessened sensitiveness of the limbus.

In artificial pigmentation of the conjunctiva, of which argyrosis is a type, they point out that the epithelium is free of pigment and that the pigment is disposed regularly along the sides of the blood vessels.

Observations have been made on the sub-conjunctival migration of Indian ink. There should be many opportunities now-a-days of making observations on those cases of detachment of the retina in which points of reference have been marked on the conjunctiva with Indian ink.

There follows an excellent classification of naevi and tumours of the conjunctiva, and their description, together with the beautiful pictures, are a feature of the book.

The authors conclude that the slit-lamp is indispensible for a complete examination of the conjunctiva.

Certainly, in examining inflammatory conditions the slit-lamp allows us to follow the vascular reaction to an irritant and the formation of the fundamental and specific inflammatory papillae, which are always richly vascularized.

Follicules, properly so-called, are already separated from papillae, and the term should be strictly reserved for those essentially follicular elements, with their poor vascularization.

Although, as the authors say, they have invented neither papillae nor follicules, their observations stretch wider than the strict domain of ophthalmology, and are such as to clear up certain facts in general physio-pathology.

In the same way, the importance of Bailliart's researches on capillaroscopy of the conjunctiva is shown.

From the purely clinical point of view, in almost all types of conjunctival affections, including tumours, all the well-known external characters are confirmed with greater precision, and certain minute lesions are revealed.

NOTES

Appointment

Mr. HENRY H. AITCHISON has been elected Hon. Surgeon to the Newcastle-upon-Tyne Eye Hospital.

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Middlemore Prize

THE Middlemore Prize of the British Medical Association for the year 1936 is announced. The subject chosen is "The Aetiology, Prophylaxis and Treatment of Myopia, especially in its higher degrees." Essays submitted in

competition must reach the medical secretary at the Association's house in Tavistock Square, W.C.1, on or before Dec. 31, 1935.

The Prize consists of a cheque for £50 and an illuminated certificate.

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Royal London Ophthalmic Hospital

THE Annual Dinner of Past and Present Students of the Royal London Ophthalmic Hospital will be held at the Langham Hotel, Portland Place, W., on Thursday, February 7, 1935, at 7 for 7.30. *Chairman:* Malcolm L. Hepburn, Esq., F.R.C.S, Tickets (excluding wine) 15/-. An early reply is requested, to Mr. P. G. Doyne, 60, Queen Anne Street, W.1.

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Corrigendum

MR. MACCALLAN writes: In my paper in the November issue on p. 637, lines 25 to 30 inclusive should be deleted and should be replaced as follows:—

> In the southern district with a population of 304,532 it was found that 2·8 per cent. were blind in one eye, and 1·1 per cent. were blind in both eyes. This very high percentage is related to the scarcity of water in the southern district, since for the whole of Palestine the percentage of blindness in one eye is 1·9, and for blindness in both eyes 0·8.

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British Medical Association

THE 103rd Annual Meeting of the British Medical Association will be held in Melbourne in the week beginning September 9, 1935.

The following are the officers for the section of ophthalmology: *President:* A. J. Ballantyne; *Vice-Presidents:* J. Lockhart Gibson, R. Foster Moore, F. A. Pockley and H. M. Traquair; *Hon. Secs.:* J. Ringland Anderson, Max. Yuille and J. H. Doggart.

FUTURE ARRANGEMENTS

1935

January 11.—Section of Ophthalmology, Royal Society of Medicine.

January 18.—North of England Ophthalmological Society, Mr. Charles Goulden, at General Infirmary, Leeds.

January 22.—North of England Ophthalmological Society, Mr. Charles Goulden, at Royal Infirmary, Manchester.

February 5.—Midland Ophthalmological Society, at Worcester Ophthalmic Hospital.

February 8.—Section of Ophthalmology, Royal Society of Medicine.

February 15.—North of England Ophthalmological Society, at Newcastle-on-Tyne.

March 8.—Section of Ophthalmology, Royal Society of Medicine (Clinical Meeting).

March 15.—North of England Ophthalmological Society, at Liverpool.

April 5.—Midland Ophthalmological Society, at Nottingham Eye Infirmary.

April 12.—North of England Ophthalmological Society, at Sheffield.

May 31.—Midland Ophthalmological Society, at Bath Eye Infirmary (joint meeting with South-Western Ophthalmological Society).

June 14.—Section of Ophthalmology, Royal Society of Medicine (Annual Meeting).

July 4, 5 and 6.—*Oxford Ophthalmological Congress*, at Oxford.

October 1.—Midland Ophthalmological Society, at Birmingham Eye Hospital.

December 3.—Midland Ophthalmological Society, at Birmingham Eye Hospital.

CONTEMPORARY OPHTHALMIC LITERATURE

American Journal of Ophthalmology. *November, 1934.*

BISHOP and BARTLEY. A functional study of the nerve elements of the optic pathway by means of recorded action currents.

FRIEDENWALD. *Notes on the allergy theory of sympathetic ophthalmia.*

THYGESON. The aetiology of inclusion blennorrhoea.

JULIANELLE and HARRISON. Studies on the infectivity of trachoma.

WALLS. The significance of the reptilian "spectacle."
HETLER and JAMES. The influence of dietary deficiency on the transmissibility of trachoma to monkeys.
SHUMWAY. Non-pigmented naevus of the lacrymal caruncle

Archives d'Ophtalmologie. *November, 1934.*

FRANÇOIS. Congenital and benign melanosis of the eye.

December, 1934.

MICHAIL. Primary sarcoma of the inferior oblique muscle.
FRANÇOIS. Congenital and benign melanosis of the eye.

Annales d'Oculistique. *October, 1934.*

VOGT. Kathodic electrolysis as a new method of treatment for retinal detachment.
SÉDAN and COULOMB. A case of naso-orbital meningocele.
VIALEIX. Granulomata of the bulbar conjunctiva with adenopathy. About two observations.
ISMAIL. Clinical and anatomico-pathological study of suppurating phlebitis of the cavernous sinus.
BASTAN. The employment of ablation of the sac, of stricturotomy and of dacryocystorhinostomy in the affections of the lacrymal passages.

Klinische Monatsblätter für Augenheilkunde. *November, 1934.*

ENGELKING. About the illumination value of different coloured lights adapted to the accomplishments of the visual organs.
NORDENSON. The accommodation process.
JUBA. The cortical double representation of the macula and the projection of the visual fibres of the external geniculate body in men.
HANDMANN. Anatomical, physiological and clinical differentiation between the upper and lower halves of the globe.
SCHLODTMANN. The delayed pathological retrogressive metamorphosis of the pupillary membrane and its connection with other diseases.
JENDRALSKI. Malignant scleritis with cavity formations.
BUSACCA. The normal limbus region in slit-lamp microscopy and in histological preparations. Introduction to the study of the limbus region and corneal trachoma.
RUBERT. Cyst formations as secondary to trachomatous disease of the lacrymal canaliculus.
BALOD. Anterior ophthalmomyasis interna.
ALBRICH. The treatment of sub-conjunctival prolapse of vitreous.
GOLDFEDER and RAPOPORT. A case of serious sight derangement after loss of blood cured by a blood transfusion.
GOLDMANN. Observations on Semadenis' essay "About fractional iris irradiation of rabbits' eyes."

Revue d'Oto-Neuro-Ophtalmologie. *September-October, 1934.*

AUBARET and JAYLE. High myopia and nanism through heriditary thyro-hypophyseal malformation. Cranio-facial dysostosis.
MONIZ. Isolated abscess of the globe.
ROGER, JEAN-SEDAN and CARREGA. Monocular nystagmus and homolateral spasmus nutans in a nurseling.

Bollettino d'Oculistica. *October, 1934.*

MOTOLESE. New contribution to the surgical treatment of high myopia.
BENCINI. Lowenstein's method of search for the tubercle bacillus in the blood in ophthalmology.
GALEAZZI. Bilateral lymphoma of the plica semilunaris.
VILLANI. Behaviour of the ciliary body and of the iris in superficial diathermy coagulation.
SANGUINETTI. Foreign body of the orbit.
AGNELLO. Calcareous fragments in the anterior segment of the globe.
MOSSA. Anisocoria in relation to organic alterations of the abdominal cavity.

Rassegna Italiana d'Ottalmologia. *September-October, 1934.*

CATTANEO. Action of Roentgen rays on some hyperplastic forms of trachomatous conjunctivitis.
CLERICI. Rubbrecht's method in the cure of corneal hypopyon.
MOSSA. The aetiology of chalazion.
CHIOVENDA and PAGANI. Gliosis of the optic nerve.
BARIGOZZI. Dominance and recession in nystagmus.
DUC. Leber's familial atrophy.
VITA. The cause of the intolerance of some hypermetropes of high grade for the meniscus lens.
CARDELLO. Influence of acetylcholine on the visual field in affections of the optic nerve.
POHORYLES. Research on the action af acetylcholine on the pressure of the retinal vessels.
GALLENGA. Biomicroscopical and experimental contribution to the knowlege of corneo-conjunctival lesions in high mountains.

Archivos de Oftalmologia Hispano-Americanos. *October, 1934.*

MARQUEZ. An atypical case of Mikulicz syndrome.
MOREU. Electro-surgery of the lens.
MIER. A case of rhabdomyoma of the orbit.
TORTELLA. Diagnosis of central retinal artery obstruction.

Revista Oto-Neuro-Oftalmologica. *October, 1934.*

PAVIA, DUSSELDORP and DURANDO. Strabismus. Semi-operative correction. Myocampsis and tenotomy. Considerations of the first 65 myocampsis results.
PAVIA. Fundus of the eye. Cinematographia. Cineretinographia.
——— Detachment of the retina. Procedure for localization and treatment of tears of the posterior pole.

Revista Oto-Neuro-Oftalmologica y de Cirurgica Neurologica. *December, 1934.*

PAVIA. About projectiles lodged in the vicinity of the orbit.
DUSSELSORP. Two cases of accidental penetration of the orbit by liquid caustic applied by way of the nose.